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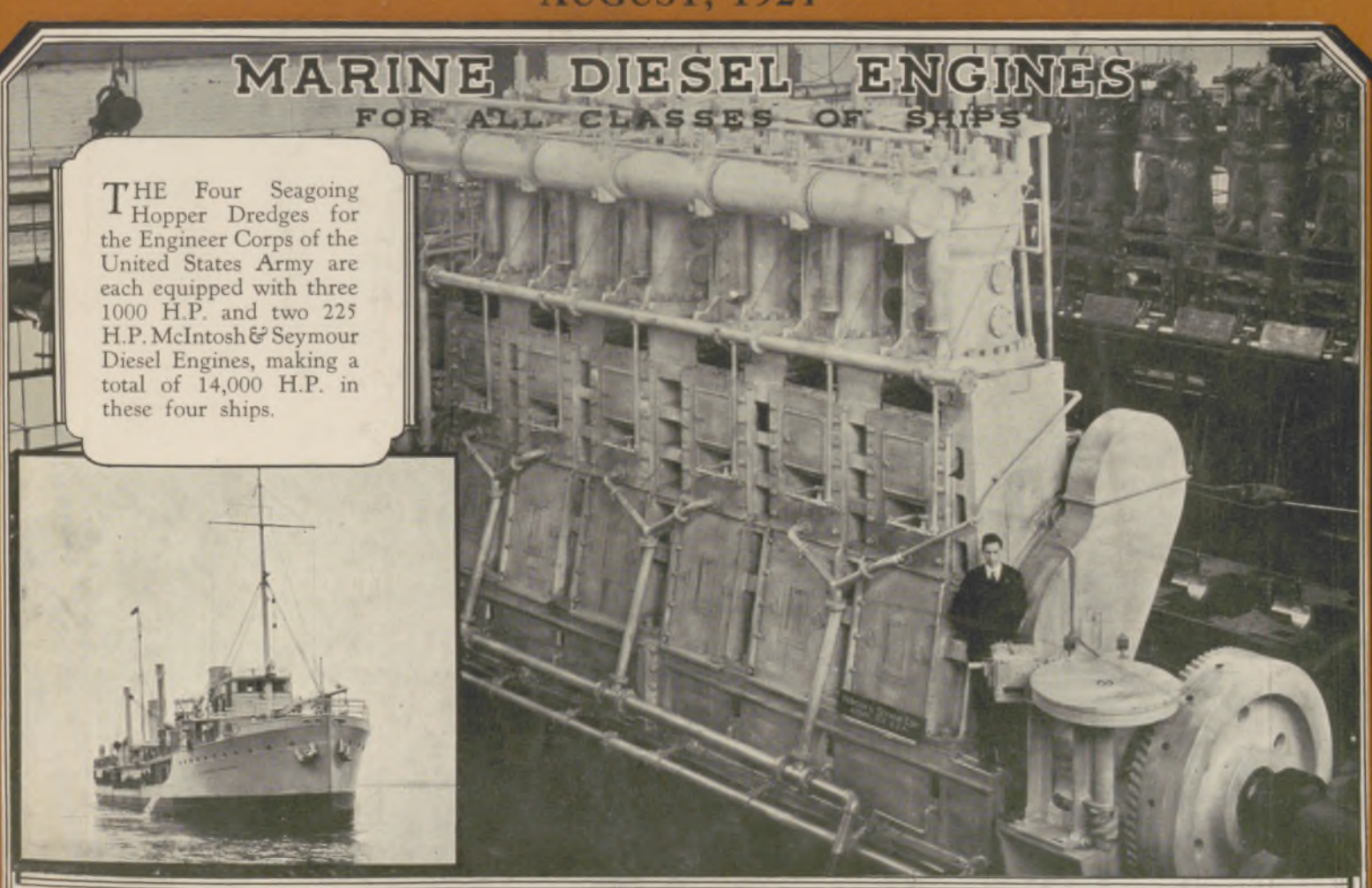

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EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

Motorship

PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

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Shipping Board's Conversion Program Nearing Active Stage

Bids Will Be Asked on Diesels for First Batch of Ships About September 15. Many Private Shipowners Will Also Convert Hulls

SHIPOWNERS are giving unqualified approval of the Steamer Conversion Bill recently signed by President Coolidge, and regard it as one of the most constructive pieces of legislation yet passed by Congress. "A lifesaver of our overseas transportation and a stimulant to the coastwise trade," one well-known shipping man quoted to MOTORSHIP. Most shipbuilders are convinced that it will be the means of reviving without delay a reasonably busy condition an industry which of late had become seriously depressed through the world-wide shipping slump from which we are just emerging. Much activity is now reported, and judging by inquiries the leading yards are receiving, numerous orders for conversions will soon be placed.

Widespread interest has been aroused in the special Conversion Supplement to be issued by MOTORSHIP on September 1st, which will contain everything of importance concerning the conversion of ships that is necessary for the shipowners, shipyards, engine-builders and equipment manufacturers to know. This supplement will form a fitting climax to the continuous effort on our part to place before the nation the vast benefits to be gained by motorizing our merchant marine and to secure the needed Federal assistance to the shipping industry. Its main object is to influence shipowners to undertake conversion work for their own account in a large way. Co-operation of the industry with us is being shown.

As regards the Shipping Board's own plans, instructions have been issued to the Department of Maintenance and Repair of the Fleet Corporation in New York City to proceed with all the necessary work incident to the preparation of specifications and contracts for carrying on the work of converting the first batch of the 60 cargo vessels to Diesel drive, as recently authorized by Congress. The work of preparing for this conversion, together with supervision of construction and installation of all machinery and refitting of vessels, will be carried out directly under the supervision of the Maintenance and Repair Department, of which Captain R. D. Gatewood, C. C., U. S. N., is Manager, all expenditures to be subject to the approval of the United States Shipping Board. Actual plans, specifications and contracts are now being actively prepared by the Technical Section of the New York Office of the Department of Maintenance and Repair. Angelo Conti has been retained by the Shipping Board as consulting advisory engineer to assist in this work, and is working in close co-operation with the Fleet Corporation authorities.

This task, which is a big one faced with many problems, is being speeded up, and bids will be called on Diesel engines for twelve to fourteen hulls of 7,700 to 11,200 tons dwc. and of 2,100 to 3,400 shaft horsepower on single screws about September 1st, or about six weeks from the time that the Department of Maintenance were authorized to go ahead. Every effort will be made to start placing contracts for the engines by October 1st, and it is expected that some of the ships will be completed in less than fifteen months from that date. When these contracts are placed, work will proceed on a second series of conversions, which will be undertaken as rapidly as can reasonably be expected.

Meetings of the Special Diesel Engine Advisory Committee, consisting of the following personnel:

Chairman, Rear Admiral H. I. Cone (Rtd.), Assistant to President of Fleet Corporation.

Secretary, A. Conti, Consulting Engineer, U. S. Shipping Board.

C. A. McAllister, Vice-President, American Bureau of Shipping.

Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy.

Major W. D. Styer, U. S. A., Engineer Corps, War Dept.

J. F. Nichols, Chief Engineer, Newport News S. B. & D. D. Co.

William F. Gibbs, President, Gibbs Bros., Inc., Naval Architects.

The meetings have been concluded and the report presented to the Board.

After very careful consideration of all phases of the situation, including a study of the different forms of oil-engine propulsion, the Committee recommended that the power for the first batch of ships be limited to six makes of direct-drive, single-acting, crosshead type engines which have demonstrated their reliability in seagoing merchant ship service.

This conservative policy was considered essential in order to avoid the risk of hampering completion of the full program of sixty ships. Such a situation may arise should there be adopted one or more new designs, which while showing excellent promise, may possibly not be fully developed by the time of installation.

The minority report, however, recommended that at least three ships be equipped with double-acting engines. Following the committee's report a questionnaire has been issued to Diesel engine builders which furnishes the Board with data concerning available engines of the types selected.

As it is the Board's desire to give every assistance to the development of the Diesel engine industry, and at the same time produce the most advanced types of merchant vessels, a more liberal policy will be followed with the next lot of hulls, and conversions will probably be authorized involving other types of power units such as double-acting engines, electric-drive, reduction gear, etc., provided it can be shown to the Board's satisfaction that the same have practical merit for the purpose intended.

Separately driven scavenger-pumps and injection-air compressors, lubricating-oil pumps and circulating pumps pertaining directly to reliable operation of the main units will not be contracted for separately by the Board unless necessary, as the engine-builders will be given the privilege of building or selecting the same, this making them responsible for the complete power-plant; a policy which may be considered a logical one. As regards fuel, the ships will be operated on Diesel oil, so tests of the engines will be conducted on that fuel.

Exact powers of the main engines, or the tonnage of the ships, have not yet been definitely settled as the Board is waiting on sufficient replies to a questionnaire recently sent out to its ship operators. This questionnaire, among many other things, asks the operators to quote the sizes and types of hulls suited to the particular services

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handled, and the most desirable speeds to be maintained and the cargo handling apparatus needed for efficient loading and unloading without excess capacities.

In all cases sufficient propelling power will be provided for the maximum sustained speed, but in many cases the hulls are not designed to maintain more than 11 knots loaded without overpowering the ship beyond reason. As replies to the questionnaire are coming in from leading shipowners experienced in the operation of both steam and motorships, it will be possible to select the hulls within three weeks. Then engine specifications will be prepared and immediately issued.

It is highly probable, and very desirable, that these conversion contracts will be distributed on the Atlantic, Pacific and Gulf coasts, but it will hardly be possible to turn any conversion orders over to the Great Lakes yards. Engine orders will not be restricted to the shipyards, but inland Diesel builders whose engines are of the types decided upon by the Committee will have the opportunity of bidding on sets to be furnished to the shipyards who do not at present construct their own engines, and possibly even to those that do if desirable. Private shipowners, contracting for the hulls, can, of course, select their own design and make of oil engine, and have the installation work carried out in any responsible yard. For this work money is available, provided the shipowner can put up an equal amount.

Section 11, of the Merchant Marine Act of 1920, originally provided for a "Construction Loan Fund," derived from the proceeds of sales and liquidations of Shipping Board plants, vessels and surplus materials, at the rate of $25,000,000 per year up to a maximum of $125,000,000 to be loaned at nominal rates to nationals for the construction in domestic shipyards of vessels equipped with the most modern and efficient machinery and appliances. As now amended this section will also permit lending one-half the cost of equipping vessels already built with the same kind of machinery, "which in reality," says the Shipping Board in a release dated June 16, 1924, and signed by Chairman T. V. O'Connor, "means internal-combustion engines and electric-driven auxiliaries."

Under this section approximately $67,000,000 has been accumulated; and Section 12, as now amended, allots $25,000,000 of this fund to the Shipping Board for a similar rehabilitation of its own vessels. This is sufficient for 60 ships totaling about 600,000 tons dw.

In a recent issue, one of the weekly shipping publications stated that less than eleven months remain for the construction loan fund to be availed either for building new ships or for re-equipping existing hulls with internal-combustion engines, on the basis that the Merchant Marine Act was passed four years ago. While it is true that the Act states that the money may be set aside by the Board for a period of five years, we can find no clause or intention of Congress that the fund must not be used after that date. Otherwise, money set aside for sales and operations during the latter part of the fifth year could not be used at all.

After a comprehensive study and survey of the Board's idle fleets, about 375 vessels were selected as must suitable for a rejuvenation of their machinery with modern Diesel propelling power. This class offers a wide range of types and sizes and includes well-preserved hulls of good design but fitted with machinery requiring extensive alterations in varying degree. Its replacement with improved steam machinery could enhance reliability and economy, but the benefits would be quite incommensurate to the cost involved.

Once, however, their motive power is replaced with modern and reliable Diesel machinery, they should prove competitive and valuable additions to the American Merchant Marine. Admittedly the cost will be high, but it should be remembered that a motorship generally consumes when at sea but one-third and when in port but one-tenth of the fuel burned by a sister steamship of equivalent power. This saving in fuel, plus that accruing from reduced engine-room personnel, and consequently reduction in wages and subsistence, has been found in practice to absorb the cost of conversion during a period of about seven years. If the great potential earning power of the converted vessels, by reasons of their enhanced cargo-carrying capacity, is taken into account, this time would be acordingly reduced.

It is well to note that the Board's vessels are now about five years old as an average, and fairly well preserved; once they are thoroughly overhauled they might be considered as good as new. Machinery, however, deteriorates faster than a steel hull, this being particularly true of a steam plant. Therefore, even though Diesels are further improved, vessels converted now will at the end of six or seven years be more desirable and possess a market value proportionately much greater than as a steamer. Some three years ago the Shipping Board adopted the policy long urged by MOTORSHIP of selling these vessels at a nominal price providing they were converted to motorships in an acceptable manner. Thirteen vessels have already been so disposed of, and are converted or are being converted to Diesel drive by private shipowners.

The combined effect of this new legislation and by the Board's policy of selling Diesel hulls at nominal prices should enable private interests to convert these steamers into efficient motorships at lower cost than equivalent foreign tonnage, which is from $60 to $70 per dw. ton for newly built vessels.

Pennsylvania R.R. Commissions Diesel-Electric Tug

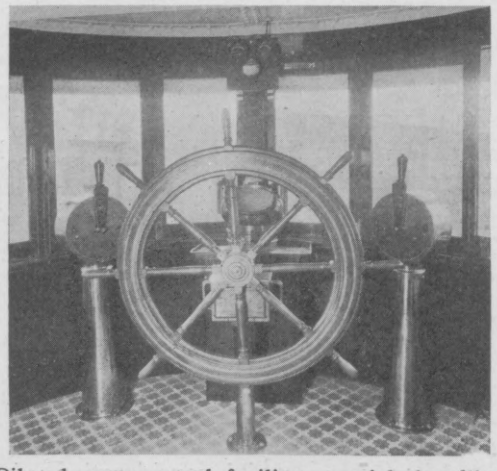
Winton Engines of 375 b.h.p. Each Furnish Power to Westinghouse Electrical Transmission Equipment

PENNSYLVANIA Railroad Tug No. 16 enjoys the distinction of being the first air-injection Diesel-electric tug ever built. During the same week in which she was commissioned an airless-injection oil-electric tug of the Atlantic Refining Company known as the VAN DYKE I also was put in operation but as complete details are not yet available concerning the latter, it is the Pennsylvania Railroad No. 16 whose story will be the first to grace the columns of MOTORSHIP.

She is 105 feet in length, has a beam of 24 and a draft of 12 feet. After her hull and superstructure had been completed at the yards of the Staten Island Shipbuilding Company she was towed over to the Hoboken Marine Yards of the Pennsylvania Railroad System where her Diesel-electric machinery was installed and where she was completely outfitted.

The source of her propelling power consists of two six-cylinder four-cycle 13¼" x 18" Winton Diesel engines each direct-connected to a 235-kw. 250-volt Westinghouse generator. As a requirement of the Ward-Leonard system of Diesel-electric control, the generators are separately excited by 25-kw. exciters flanged to the same through-shaft and mounted on the same sub-base as that which carries the main power units. Each aggregate runs at 260 r.p.m. and the voltage both of the generators and exciters is 250. The brake horsepower rating of each Diesel engine is 375 so that a combined output of 750 effective h.p. is available to meet the requirements for main and auxiliary power. Edison storage batteries, charged by a Westinghouse motor-generator, furnish current for electric lighting.

Double armatures are used for the propelling motor, which is flanged to the tail-shaft and normally develops its full power of 575 h.p. at 125 r.p.m. An especial ad-



Pilot house control facilitates quick handling of the boat

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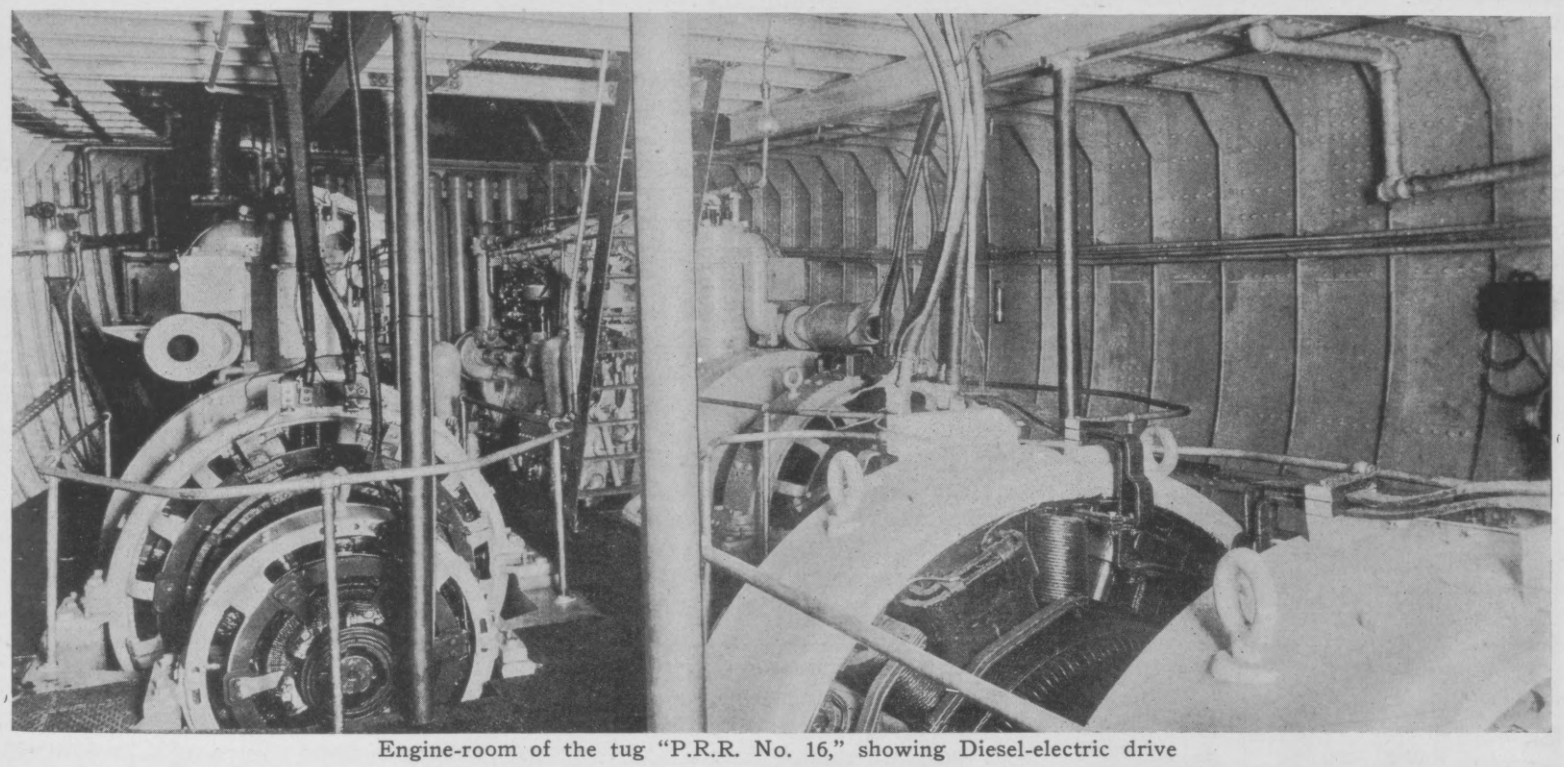
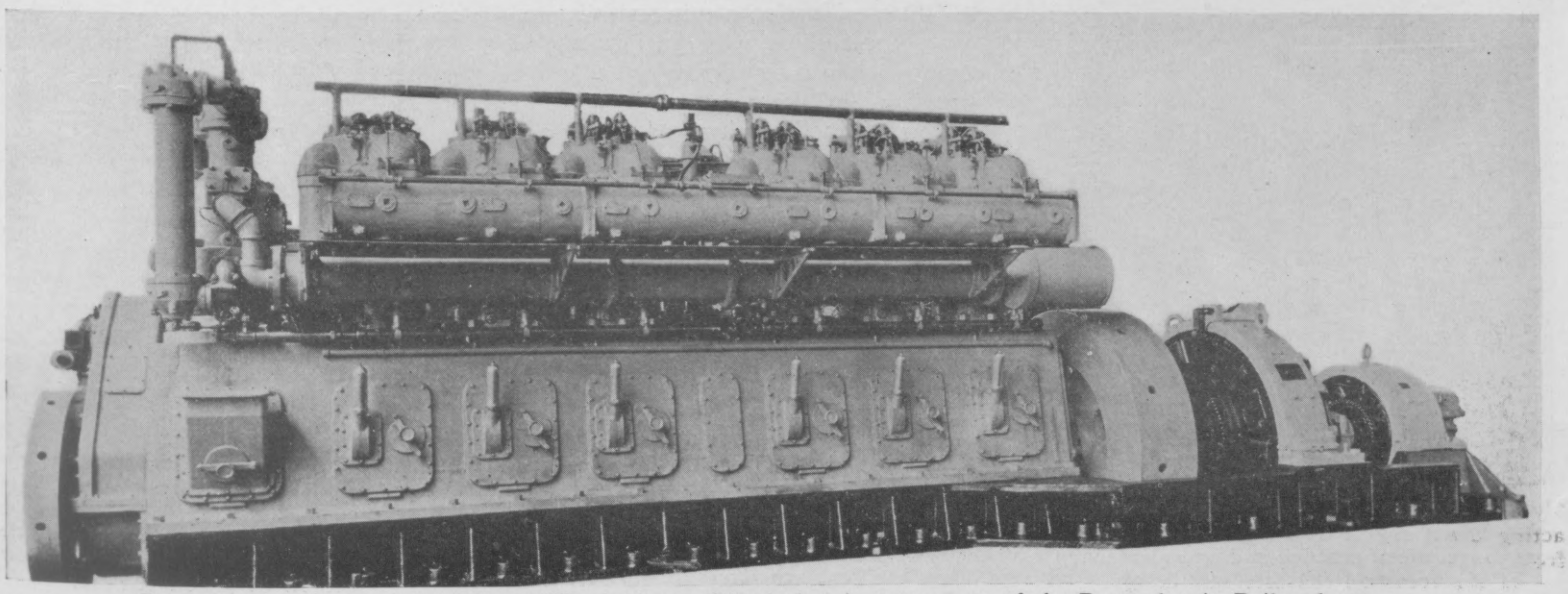
The first Diesel-electric tug. She is owned by the Pennsylvania Railroad



Engine-room of the tug "P.R.R. No. 16," showing Diesel-electric drive



General view of one of the Winton-Westinghouse Diesel-electric power sets of the Pennsylvania Railroad tug

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vantage of the electric drive for towing purposes consists in the fact that the propelling motor can easily be so controlled as to develop its constant maximum power over a wide range of rotative speeds and with little or no sacrifice in economy. All direct-connected engines, whether steam or Diesel, fall off in power when the speed is reduced, as is the case in handling a heavy tow. Not so with the electric motor: by a simple shift from two to one armature or by a modification of the relatively light excitation current it can be adapted with ease to give full power at exactly that propeller speed which the conditions of the tow demand.

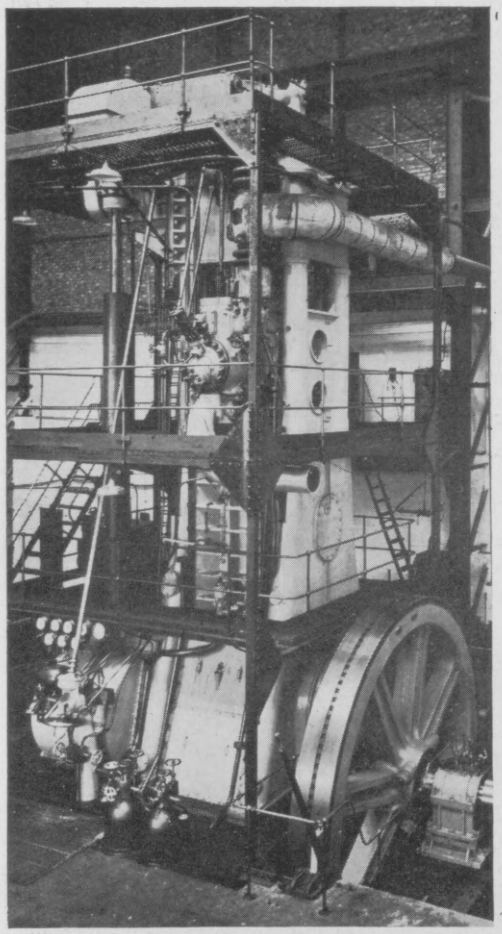
Both the generators and the propelling motor are separately excited and there is never any need of cutting in or out the main propelling current. As soon as the excitation is cut out the heavy current dies naturally without the production of fireworks. Variations in excitation, accomplished from the pilot house by ingenious as well as simple electric controls enable the master of the vessel to vary speed and to effect stopping and reversal with a degree of precision that bids fair to be of immense value in the operation of tug-boats. Taking up the slack in a tow-rope, for instance, requires no small amount of skill with the old-fashioned signal-gong arrangement and even in the hands of experienced skippers the parting of hawsers is not uncommon. The same applies to the maneuvering of the tug alongside of docks and ships, where inaccuracy of control is bound to produce damage and increased upkeep. In view of these facts the operation of the newly-commissioned electric-drive tugs is bound to be closely observed by shipping and harbor authorities.

Direct observation of the tug's operation will make this immediately apparent to the eye as remarkably sensitive maneuvering has already been amply demonstrated in the case of other electric-drive motor vessels, such as the J. H. Senior, for instance. But the ultimate proof of this should show up in decreased maintenance on bulwarks, fenders, hawsers, etc.

Tests of New Double-Acting Development Cylinder

Following Its Successful Trials, Alfred Holt & Co. Place Order for North Eastern-Werkspoor Engine of 4,000 s.h.p for Single-Screw Motorship

DURING the last few months there has been a world-wide centering of marine engineering thought on double-acting Diesel engines, and a year from now there are likely to be about twenty different designs available. Sets are being considered for standardization in powers as low as 2,000 s.h.p., whereas a year ago double-acting engines of this power were only regarded as initial steps to the big units. The recent conversion program of the U. S. Shipping Board and the question of limited space and low revolutions coupled with the race for advance of construction, has suddenly awakened engine builders to the realization that for the next few years there is likely to be as much steamer conversion as new motorship construction—not only in America but also in European countries. Moreover, the production of a line of double-acting oil-engines from 2,000 to 20,000 h.p. will cover every class of merchant ship afloat, whether new hulls or for conversion of old hulls, as well as being likely to bring down the manufacturing costs.

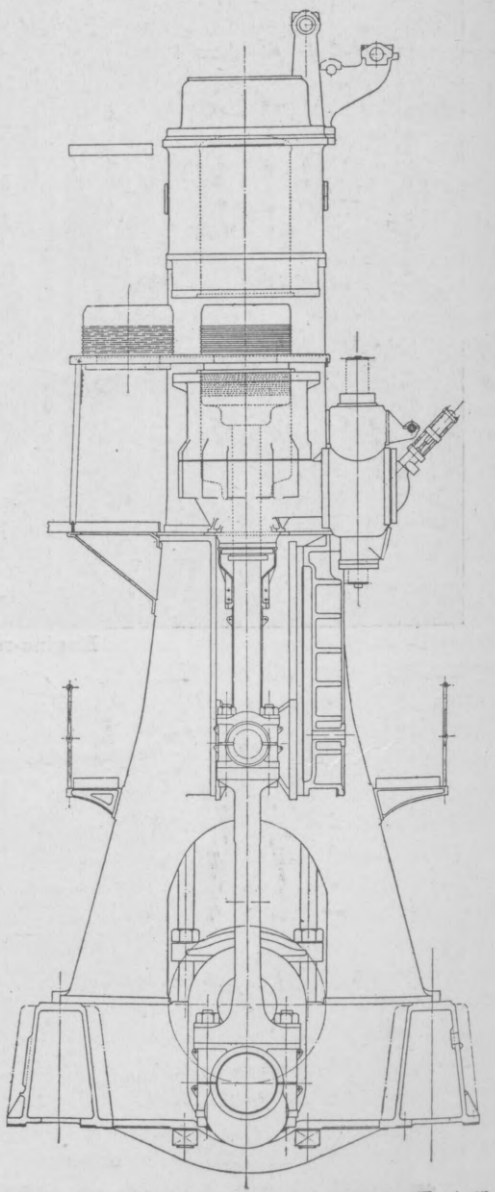


The new North Eastern-Werkspoor double-acting Diesel engine does not depart radically from conventional practice and embodies many of the licensor's characteristic designs

As the result of shop tests of the first single-cylinder double-acting type of four-cycle Diesel engine built at Wallsend-on-Tyne, England, by the North Eastern Marine Engineering Co. in collaboration with Werkspoor of Amsterdam, a 4,000 s.h.p. engine of this design has been ordered for a single-screw motorship by Alfred Holt & Co. of Liverpool. This well-known shipping concern seems determined to keep abreast of all motorship progress and to test out under sea-going conditions nearly all the leading designs of oil-engines including those of radical nature, such as the Scott-Still combination steam-and-oil power, since motorships with various makes of engines are in their service or are under construction for them.

In view of another phase of double-acting Diesel development under progress at the Amsterdam plant, the order for this 4,000 s.h.p. single-screw motorship carries considerable importance. Furthermore, it would indicate that the test-engine built at Newcastle has given such encouraging results that success with the big engine is sure. Pressure on space has prevented our hitherto giving other than a brief description of the North Eastern-Werkspoor unit, but at this time we are enabled to devote room for additional data and illustrations.

Retaining the normal design of cylinder head and valve gear for the top end of the cylinder, the builders have added only that much to the bottom end as is necessary for double action. Exhaust and inlet valves interchangeable with those used on the top side are fitted, the only difference being those connected with the clearance volume, the fuel valve, cam drive, and maneuvering cycle. As will be apparent from the illustration, the spray valve is placed at a slant



End profile and section of North Eastern-Werkspoor double-acting engine showing method of piston removal

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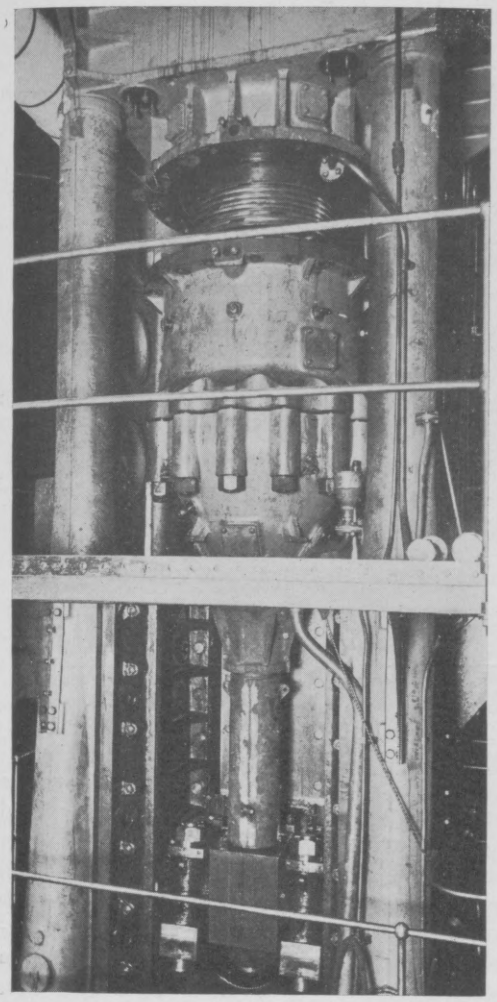


Split sleeve around piston rod takes weight of lower cylinder head while piston is removed

and its jet is far removed from the surface of the piston rod.

Several considerations prompted the use of a clearance volume larger than normal and a compression pressure of between 200 and 300 lbs. per sq. in. One of these, already referred to, is the use of exhaust and inlet valves interchangeable with the top, which it would have been difficult to accommodate in a clearance volume of the usual size. A larger space reduces the percentage of "dead" air, or that part of the cylinder charge which is prevented by its location from becoming available for combustion. Locating the fuel valve far from the rod protects the latter against erosion and has resulted in it running at hand-temperature during the trials.

Naturally the pressure stated does not suffice for starting on the bottom, an operation which is therefore carried out in the top end. After the engine has been gotten under way on starting air, it is allowed to run for a short time with fuel on the top end only, for which a definite position of the maneuvering lever is providing. At this same position also, the cam drive is so set that the inlet valve is permanently held shut while hot gases (from the top end) are breathed back and forth through the bottom end exhaust valve. Exhaust pyrometers show when a temperature sufficient to insure firing in the lower end has been attained, an interesting side-light on the significance of these instruments from the point of view of applying the most modern methods to the design and operation of oil engines. At the point, then, where firing in the lower end is assured, the maneuvering lever is thrown over to the full running position; all bottom-end valves thereupon function normally and the usual cycle of operation is maintained.

After the engine has been shut down for as much as half an hour it is still possible to resume double-acting operation immediately after starting without first warming up the lower end.

Principal dimensions of the engine are as follows:

Bore	31½ in.
Stroke	55 in.
Speed	95 r.p.m.
Normal Power, shaft	600 h.p.
Normal Power, indicated	750 h.p.
Maximum Power, indicated	1,000 h.p.
Crankshaft, diameter	18½ in.
Piston Rod, diameter	9⅞ in.
Connecting Rod, diameter	8⅞ 1n.

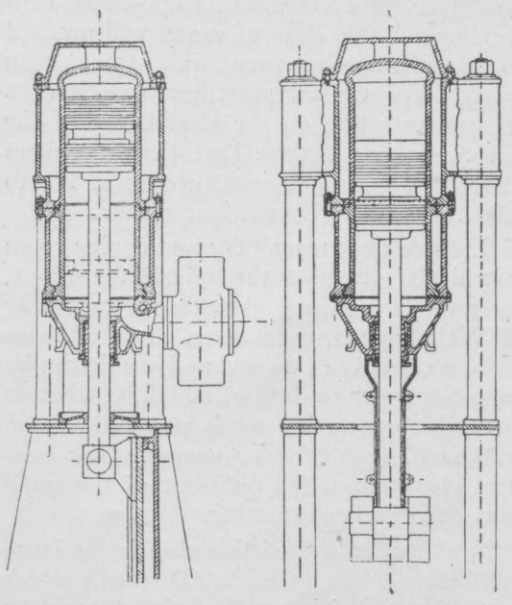
Some of the initial test results are as follows:

Date of trial	10/5/24	16/5/24	22/5/24
Duration of test	4 hours	4 hours	4 hours
Revolutions per minute.	93.7	93.4	93.9
Indicated horse-power	730	730	725
Brake horse-power	585	592	598
Mechanical efficiency, per cent	80	81	83
Fuel consumed in lb. per B.H.P. hour	0.428	0.423	0.424

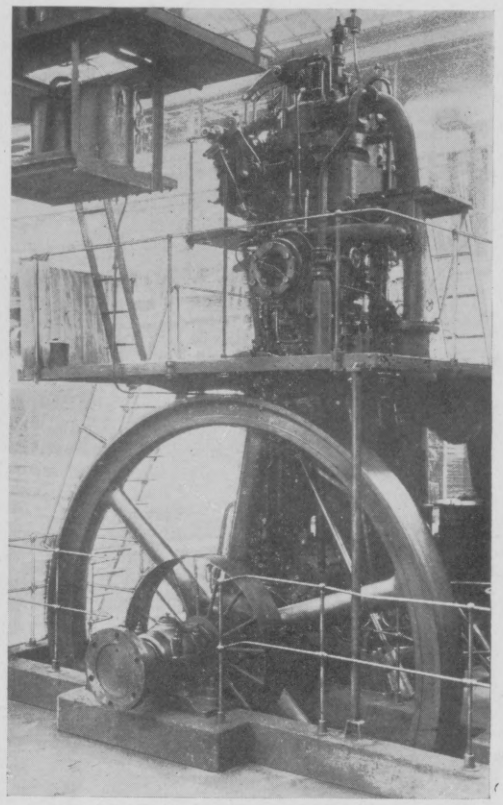
A gib crosshead with separate astern guides is used, and a new method for taking the return load on the main bearing caps is employed. The top shells are held down by yokes spanned between the main steel tie rods, to which they are secured by means of large nuts. Side-wise removal of the piston of the kind which has been used for a long time on single-acting engines of this make, is also retained in the double-acting design.

New Design Saves Space

As is clearly shown by the accompanying illustration, gotten up by Werkspoor of Amsterdam, a considerable saving in space



Bottom-end combustion space consists of neck leading to valve pocket



From this first Werkspoor double-acting Diesel engine built in Holland data was furnished for building the new North Eastern machinery

can be effected by using the double-acting engine. A six-cylinder engine made up of double-acting units such as the one which has been built and which is described in the foregoing would compare with an equivalent eight-cylinder single-acting Werkspoor machine about as shown in the drawing. The engine-room could be shortened by 12 feet and the weight of the installation reduced 20 per cent. In view of these facts a considerable increase in the use of double-acting engines is confidently to be expected.

The following are specifications of the fuels used in the tests of the North Eastern-Werkspoor double-acting engine; all three oils are Diesel oils, and they were burned exactly as delivered by the oil companies, and their characteristics are as follows:

	A	B	C
Specific gravity at 60° Fahr..	0.8819	0.8710	0.8881
Redwood viscosity at 100° Fahr.	47.8 secs.	36.0 secs.	64.6 secs.
Flash point closed	193° Fahr.	185° Fahr.	184° Fahr.
Ash	0.017%	0.0016%	0.0092%
Water	Under 0.05%	Under 0.05%	0.50%
Hard asphaltum	3.30%	Nil.	0.815%
Calorific value— Gross (B.T.U)	19,346	19,420	19,278
Net	.....	18,160	.....
Sulphur	1.42%	0.27%	1.18%
Carbon	86.57%	87.16%	86.31%
Hydrogen	11.96%	12.62%	11.71%
Nitrogen	0.15%	0.16%	0.16%
Oxygen	Nil.	Nil.	0.13%

The North Eastern Marine Engineering Co. have proceeded with further tests, and appear confident of being able to improve considerably on the present very satisfactory figures.

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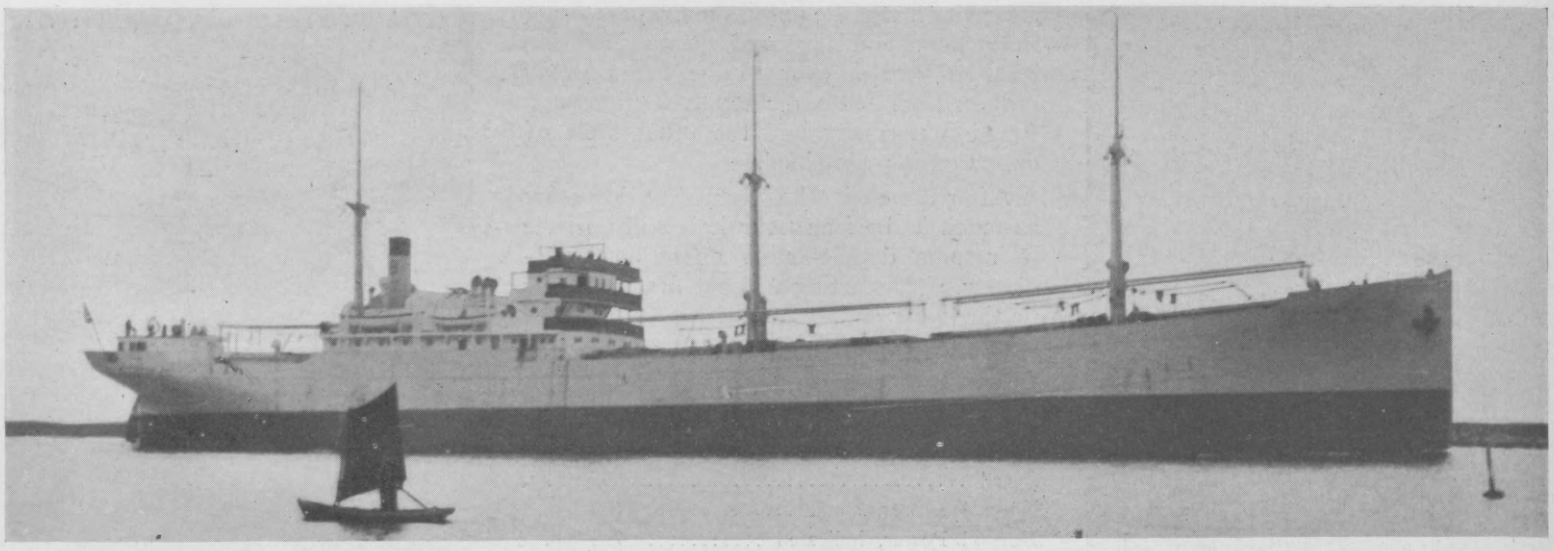

Motorship "Gisla" is propelled by twin B. & W. trunk-piston engines aggregating 2,200 s.h.p. Pistons are oil-cooled and propellers are designed to operate efficiently at 160 r.p.m.

Driving 9,000 Tons at 160 r.p.m. Propeller Speed

New Danish-Built Motorship Has Twin Burmeister & Wain Trunk-Piston Diesel Engines

WHETHER or not motorships are to be adopted by Scandinavian firms is no longer a question of opinion concerning their merits. Constant alertness and quick action is the governing policy and is limited by nothing except the consideration of amortizing the capital invested in the old steamships. In fact, gains are realized by not waiting for complete amortization since the extra profits which result from the prompt commissioning of motorships can be made to balance any losses due to the disposing of steamships before their first cost has been written off. Naturally, trade and shipping conditions have an influence in determining the point at which particular routes are given over to motorship operation, but as the world's motorship tonnage mounts rapidly and competition is intensified, it pays better and better as time goes on to commission motorships with the utmost promptness.

The GISLA, a combined product of the A. P. Moller's Odense (Denmark) Steel Shipbuilding Co. and of the Burmeister & Wain engine works, is well-fitted to initiate the motorshipping policy of a Norwegian company. As a shelterdeck vessel, she has been built to the highest classification of the Norwegian Veritas and has a certificate for grain cargo and for carrying fuel oil in her double bottom. She is owned by the Avenir Steamship Co., Kristiania, Norway, and plans were published on page 270 of our issue of April, 1923.

Deadweight capacity	6,400 tons
Capacity of hold (grain)	377,000 cu. ft.
Double bottom capacity (fuel oil)	1,000 tons
Length, b.p.	360 ft.
Breadth, moulded	50 ft. 9 in.
Depth, moulded	23 ft, 11 in.
Power of twin main engines	2,200 i.h.p.
Speed of main engines	160 r.p.m.
Bore and stroke	500 mm. by 900 mm.
Speed of ship	10¾ knots

Attention of American coastwise shipowners is drawn to the engine speed of the Diesels installed in the GISLA, namely 160 r.p.m. That a shipbuilding concern with the wide experience of Burmeister & Wain, who also developed the long-stroke slow-speed crosshead oil engine, should advocate direct drive trunk-piston engines of 1,100 i.h.p. for vessels of about 7,000 tons d.w. and 9,000 tons displacement is a good demonstration of their practibility.

With such engines the weight and length factors show distinct gains over steam machinery for coastwise vessels, and the first cost is much lower than the cost of slow-speed oil engines. Moreover, fuel saving is not the only benefit as has been claimed by some who appear to have studied the subject of motor power for coastwise shipping from one angle only.

Tests made by Burmeister & Wain conclusively prove that excellent propeller efficiency can be secured at these speeds. Their motorship CRUX, with engines turning at 150 r.p.m. seems to be giving very fine results, hence the 160 revolutions for the GISLA. Once this is realized by our naval architects and coastwise shipowners conversions of this class of vessel will proceed as rapidly as they are with trans-ocean craft. For coastal passenger vessels such as are operating on the East Coast of the U. S. A., we believe that two propellers driven by Diesel engines turning at 175 to 200 r.p.m. will give efficient results.

Electric deck machinery and engine room auxiliaries are used throughout the GISLA, current being furnished by three Burmeister & Wain engined generators. Two of these have a capacity of 33 kw. and are driven by single-cylinder engines of 50 b.h.p., whereas a 66-kw. generating set is powered with a 100-b.h.p. twin-cylinder engine. For normal operation at sea only one of the small sets need be kept running.

Another feature of this ship is the large bunkering capacity of 1,000 tons, which gives her a cruising radius of 33,000 miles. Since ordinary voyages will require no such quantities of fuel as this, some of the bunker space should actually be credited to the cargo capacity of the ship. This would mean that the GILSA is capable of doing an attractive business in transporting fuel oil by purchasing it in ports where it can be obtained cheaply and disposing of the surplus in localities where good prices are offered or to the owner's own steamers. She only uses 7¼ long tons of fuel a day or 145 tons for a 20-day voyage.

Lloyds Reports for Three Months Ending June 30th

Encouraging signs are given by Lloyd's shipbuilding reports for the quarter ending June 30th as they show a world gain of 100,000 tons over the total three months ago; although unfortunately, the United States shows a loss of 16,000 tons. This is perhaps deceiving because of the considerable amount of conversion work now under way and contemplated in this country, which means changing idle ships into economical vessels to be put into service. Also, much of the large domestic oil-engined workboat construction does not come within Lloyd's survey.

Lloyd's report states that the motorship is in favor as shown by the steady growth. On June 30th there were being built throughout the world more than 800,000 tons of this type of vessel as compared with 700,000 tons on March 31st, which would indicate that the increased tonnage is entirely due to new motorships ordered. This is most significant. Lloyd's figures are as follows:

Motorships Under Construction, 1924

	June 30th	*March 31st*
Great Britain & Ireland	355,590	325,190
Other Countries	455,065	369,522
World total	810,655	694,712

(Steamer Conversions Not Included)

Motorship construction—says Lloyds—now represents not far from one-third of the entire shipbuilding of the world.

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23,000 tons Diesel-driven passenger liner "Aorangi" shortly after launching. She is but one of 15 motorliners aggregating 100,000 tons and 154,000 h.p. now building in Europe, all of which will be surpassed by the two transatlantic Diesel ships which the Shipping Board proposes to construct if Congress consents

First of the Big Transocean Motorliners

Union Steamship Co.'s 23,000 Tons Displacement Ship AORANGI *Launched on the Clyde*

IT is only a question of a few months before large passenger motorliners will be plying both the Pacific and Atlantic oceans, supplementing the smaller vessels of this class, such as the Elder Dempster Co's. and British India S. N. Co's. ships, as well as augmenting the hundreds of cargo and tank motorships now in service. The first of the big fellows, the AORANGI of the Union Steamship Line of New Zealand, was launched on June 17th last, and her Diesel engines are now being installed following successful shop tests. When it is mentioned that this vessel will have a crew of 330 officers, engineers and men, and will carry 970 passengers and 315,000 cu. ft. of cargo in addition at an average speed of 18 knots from Canada and the West Coast of the U. S. A. to New Zealand, it is possible to realize the great strides which have been made with Diesel engine development since the war. It is also significant that this great craft is powered with the two-cycle type of Diesel, which several years ago was regarded by some authorities as having a very doubtful future, demonstrating that many serious engineering problems have since been solved.

So rapid has been recent progress that there are now building 15 oil-engined passenger motor liners aggregating almost 100,000 tons *gross* and 154,000 indicated horsepower, and others are planned. As stated by the AORANGI's builders, "she will prove another phase in the gradual passing of the steam reciprocating engine and steam turbine to the National Maritime history." This magnificent vessel should do much to create public sentiment in favor of U. S. Congress authorizing the Shipping Board to construct the two proposed larger motorliners, augmenting our present transatlantic passenger fleet in a most valuable manner. [Since the foregoing was written a 15,000 s.h.p. double-acting Diesel has been ordered from the M.A.N. for a large liner. —*Editor.*]

The AORANGI's power is being conservatively distributed on four screws, there being *four* six-cylinder 27½" by 39" Fairfield-Sulzer two-cycle Diesel engines of the crosshead type, each developing 3,250 s.h.p. at 127 r.p.m., with a piston speed of 825 ft. per minute and a weight of 295 tons. On shop trials one of these engines developed 4,750 i.h.p. or 3,800 s.h.p. on a 20% overspeed run of 2 hours at 152 r.p.m., and 3,552 s.h.p. on an overload test of 12 hours at 131 r.p.m. Hence, while the regular total power is 13,000 s.h.p., the possible emergency power when in the ship coupled to the propellers is 14,208 s.h.p. at three revolutions above the regular full-power load.

The leading dimensions of the AORANGI are as follows:

Displacement	23,000 long tons
Registered tonnage	17,500 gross tons
Power of main engines	13,000 shaft h.p.
Power of main engines	16,000 indicated h.p.
Maximum power on test bed	19,750 i.h.p. or 15,000 s.h.p.
Power of auxiliary Diesels	4 of 410 b.h.p. each
Engine speed	127 r.p.m.
Ship's speed	18 knots
No. of engines and screws	4 of each
Fuel-consumption test	0.392 lb. per s.h.p. hour
Fuel used	Boiler oil of 0.94 gravity
Daily fuel consumption	47 to 55 tons, incl. auxl's.
Total No. of cylinders	24
Bore and Stroke	27½" by 39"
Piston speed of engines	825 ft. p.m.
Length of ship	600' 0"
Breadth	72' 0"
Depth	46' 6"
No. of decks	6
Length of engine room	72 ft.
Fuel capacity	3,000 tons
Cruising radius	15,000 nautical miles
Fresh water capacity	1,000 tons
No. of officers, engineers, stewards and crew	330 men
No. of firemen	3 men for donkey boilers
No. of passengers (first class)	440
No. of passengers (second class)	300
No. of passengers (third class)	230
Total cargo and refrigerating space	315,000 cu. ft.
Heating arrangements	2 steam boilers
Make of Diesel engine	Fairfield-Sulzer
Builders of hull	Fairfield S. B. Co.
Owners	Union S. S. Co. of N. Z.
Route	Vancouver, B. C., to Sydney, N. S. W., via Honolulu, etc.
Time per one-way voyage	18 days

The vessel has finely designed lines with

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a cruiser stern, and as will be seen from the illustrations, she will be a handsome ship. She will have two large stacks, which we are rather sorry to see, as absence of the same would give her a distinctive and striking appearance in addition to providing more room on the boat deck. The AORANGI derives her name from the Maori name of Mount Cook.

Some indication of the great size of the vessel with her displacement of some 23,000 tons can be gathered from her dimensions of 600 ft. length by 72 ft. breadth and 46½ ft. depth to the lowest weather deck, with four decks below and two decks above, together with numerous superstructures, and with her finely designed lines and handsome cruiser stern, her form is to be much admired. Accommodation has been arranged for about 440 first-class passengers, 300 second-class passengers, and 230 third-class passengers, together with a complement of 330 officers and crew, despite the elimination of nearly all firemen and trimmer ratings, only a few stokers being required for the donkey boilers.

Practically no thought or expense is being spared in the design and furnishings of her first-class public rooms to combine the stately dignity of historical period decoration with the comfort and hygienic practices of the present day. And the standard recently set up by high-class liners for luxurious comfort in traveling on deep sea voyages is being more than maintained in this new vessel by the well proportioned and skilfully modelled architectural detail of the rooms.

The first-class dining saloon is designed after the period of Louis XVI, with carefully arranged panelling painted in varying shades of Trianon Grey color. The well opening above is surrounded by gilded wrought-iron balustrading, with a large decorated tapestry panel after the manner of "Boucher."

The remainder of the extensive range of first-class public rooms are grouped together with through communication on the promenade deck. One of the largest and best appointed of these rooms is the first-class lounge hall, which is no less than 64 ft. in length by 43 ft. 6 in. broad, and of unusually dignified height, with a handsome gallery above. Its Georgian scheme of decoration is being architecturally and artistically carried out. An open staircase of impressive character ascends from the after end of the lounge to the gallery above. A fine oil painting of Aorangi, or Mount Cook, is incorporated in the panelling at the half landing of this staircase.

The adjoining first-class smoke room, 34 ft. long by 25 ft. wide, is designed after the Jacobean period. The two first-class veranda cafes have been treated as garden cafes, open to the principal promenade deck. The music room or ladies' room, 42 ft. by 21 ft., is decorated in Louis XVI style of a quiet phase.

A handsomely panelled room, near the first-class dining saloon forms an attractive auxiliary dining-room for private parties, and also serves as a children's dining saloon during the day. A large nursery, with a novel scheme of decoration, equipped in every respect for the amusement of the younger generation, is situated adjacent to the attractive main entrance hall.

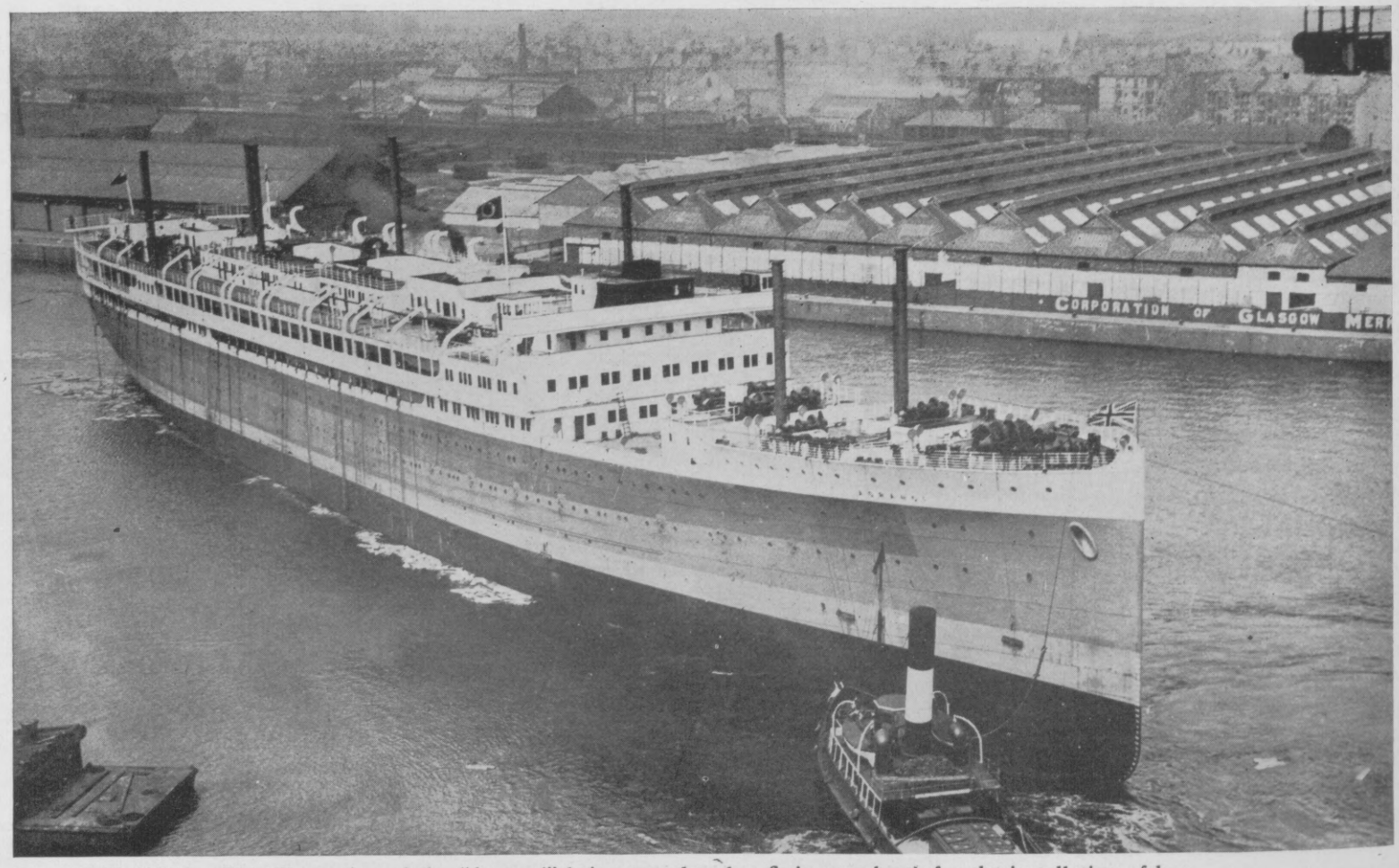
A well lighted writing room, tastefully decorated on the same lines as the music room, together with a conveniently placed and well equipped ladies' dressing room, and also a light and airy gymnasium on the open deck complete the public rooms for the first class. Eight special cabins-de-luxe, each with well appointed marble lined bath rooms attached, are situated on the principal promenade deck, panelled and luxuriously furnished in different period styles.

A large area of promenade deck near the first-class veranda cafe has been alloted and equipped for open air dancing when in tropical waters, while arrangements have been made for providing film displays for a comprehensive cinema programme in the lounge during the voyage.

The whole of the vessel has been heated by means of a specially designed low-pressure steam heating system, under the control of the individual passenger, circulation being insured by a vacuum pump on the exhaust, while electric heaters have also been provided in various parts of the vessel.

Pressure on space at this time prohibits our fully describing the first-class accommodation and its decorations, or outlining the second or third-class accommodation; but it is our plan to do this when the ship is completed and interior photographs are available.

The cargo capacity of the ship is divided into 225,000 cu. ft. for cargo and general parcels, baggage room for passengers' trunks, a bullion room and mail rooms for



Copyright, World Wide This illustration of the "Aorangi" being towed to her fitting-out berth for the installation of her big Diesel engines gives a good conception of her passenger capacity

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the carriage and sorting of post-office matter. Then there is 90,000 cu. ft. of refrigerated cargo space for the carriage of fruit, meat and dairy products.

In such a modern up-to-date ship it seems a pity that steam-driven winches should be installed on deck, steam for these being provided by donkey boilers, when so many excellent electric winches are available. Steering of the ship is by a hydro-electric steering control from the navigating bridge by a telemotor, the steering gear itself being in duplicate to avoid risks and breakdowns.

As regards the four main 3,250 s.h.p. Diesel engines and the four auxiliary Diesel engines they depart in but few details from the well-known characteristics of the Sulzer design of machinery. Attention is called in passing to the fact that Sulzers have retained the box-frame construction for crosshead engines of larger capacity than any manufactured by other firms. As the result of this practice great stiffness is imparted to the entire structure, a consideration of prime importance for the maintenance of alignment of all working parts irrespective of engine loading or ship's deflections. The box-frame also lends itself well to the adaptation of the four-shoe crosshead, the guides for which are mounted directly on the transverse webs that partition off the individual crank chambers.

Both the fuel and starting valves of these engines are accommodated in a single central valve cage, a procedure which permits the use of an essentially conical cylinder-head casting free from the usual pockets and complications. One of the few departures from the usual Sulzer design is a modification of the scavenging method and consists of the use of automatic plate valves for the control of the upper row of auxiliary ports. Since they lift and allow the scavenging process to commence promptly as soon as the exhaust pressure in the cylinder permits it, they make available a greater time-area opening than is the case with mechanically-operated valves. Obviously, also, the elimination of the driving and reversing gear necessary for the latter mechanisms is a great advantage and leaves only one valve—the one for fuel injection—to be operated while the engine is running.

Scavenging air is supplied by means of independently-driven turbo-blowers at the surprisingly low pressure of 1.75 lbs. per sq. in. As a result, bulky reciprocating scavengers are no longer fitted to the engines, and a pronounced saving in space and weight is effected. The turbo-blowers are electrically driven and have only a single moving part—a through shaft on which are mounted the motor armature and the turbo impeller. Motors of 430 h.p. capacity are provided, but for normal running it is estimated that only 300 h.p. or 200 kw. will actually be required. Three of these blowers are installed, and as one of them is capable of supplying two out of the four engines, a standby of one machine is available.

Load	Duration of Trial	Mean Indicated Pressure	Revs. per Min.	I.H.P.	S.H.P.	Mech. Effy.	Fuel Oil Consumpt. per b.h.p. Hour
	Hours						
3/4	1	74.2	114	2,967	2,360	79.5%	0.373 lb.
4/4	72	88.1	126.8	3,915	3,220	82.2%	0.392 lb.
12% Overload	12	94.1	131	4,321	3,552	82.1%	0.412 lb.
20% Overspeed	2	89.1	152	4,750	3,800	80.0%	0.430 lb.

Shop tests recently made on the AORANGI's engines gave the above results.

The most important of these is the one which was run at full load for 72 hours without any unusual incidents. It was followed immediately by the 12% overload test, which also proceeded uneventfully. Upon being shut down and opened up for inspection, the engine was found to be normal in all respects. As stated, the normal rating is 3,250 s.h.p. at 127 r.p.m., at which the conservative piston speed of 825 ft. per min. is obtained.

Auxiliary power is furnished by four Sulzer Diesel engines rated at 410 b.h.p. and direct-connected to electric generators. Now that the ship is in the water, the complete fitting up of this equipment will be rapidly undertaken, and in a few months the AORANGI will pass through the Panama Canal.

At the launching ceremony Sir Alexander Kennedy, chairman and managing director of the Fairfield Shipbuilding Co., stated that "the Union Steamship Co. had decided to build the ship at a time when the future seemed very black indeed, but appearances to-day indicate that they had acted wisely. The development of the motorship as exemplified in the vessel launched that day was full of promise for the future. Much of the tonnage now laid up would have little or no chance of holding its place in competition with such modern and up-to-date vessels."

Continuing, Sir Alexander said: "The type of propelling machinery being fitted in the vessel was selected after much thought and careful investigation, every type of internal combustion engine being considered. At the end it was decided that the Sulzer Diesel was the one best suited to the particular requirements for the class of vessel which they had in view."

A number of important shipping men were present at the launching, including Sir James Mills, chairman of the Union Steamship Co. of N. Z. The following directors of the Fairfield Shipbuilding Co. were present: Rear Admiral Sir Douglas Brownrigg, W. O. Workman, Robert Traill, G. Strachan, A. J. Hendin, T. A. Greer.

Accompanying Sir James Mills was Charles Holzwarth, managing director of the Union Steamship Co. The Diesel engine licensors were represented by Dr. Robert Sulzer, the Hon. Hans Sulzer and H. Wolfer Sulzer.

Motor-Steamer "Dolius's" First Voyage

Data on 8,000 Tons Freighter Equipped with Combination Diesel-and-Steam Propelling Engines

Particulars have previously been given regarding the twin-screw 8,000 tons d.w. motor-steamer DOLIUS, propelled by two Scott-Still combination oil and steam engines, in which internal-combustion is used on the down stroke of the pistons and steam on the upward movement. Great economy of operation has been claimed for this novel type of power, so the ship's maiden voyage has been awaited with interest in shipping circles.

The DOLIUS left Cardiff, Wales, on May 19th at 7 p.m. with a load of coal, displacing 10,840 tons, and averaging 11.84 knots at 126 r.p.m., or at higher revolutions than designed for. For the next 30 hours fog caused the speed to be reduced to 7 knots at 80 r.p.m. Then for two days she averaged 11.1 knots at 121 r.p.m. on a fuel consumption of 8 tons per day. To reach Algiers at a suitable time for discharging cargo, the revolutions were increased to 128 r.p.m. and the ship's speed to 12 knots, the consumption increasing to 9 tons.

Average speed for the 1,601 miles (1,443 miles by log and 1,506 miles by screws) voyage worked out at 11.45 knots, and the fuel consumption for all purposes is 8.4 tons per day. There were no involuntary stops or slow-downs of any nature. The power averaged was not given, consequently, we cannot state the mean fuel-consumption per s.h.p. hour. Nor is the grade of fuel-oil used quoted. The engines were designed to develop 1,250 s.h.p. each. However, when the ship was running at 12 knots with a displacement of 10,840 tons her engine figures were as follows:

	Port	Starboard
Average combustion, m.i.p.	62.7 lb./sq. in.	65.15 lb./sq. in.
Average referred to Steam	5.56 lb./sq. in.	5.46 lb./sq. in.
Total m.i.p.	68.26 lb./sq. in.	70.61 lb./sq. in.
R.P.M. approx.		128 to 129
Collective I.H.P.		2,434

Conversion of the "Allentown"

At the request of the Atlantic Refining Company, we have held over until next month our story on the conversion of the tanker ALLENTOWN to Ingersoll-Rand-Westinghouse Diesel-electric power.

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Success of Another Conversion

A 13½ PER CENT increase of cargo capacity, a cut of the fuel-consumption from 24 tons down to 7 tons per day, or less than one-third, a reduction in engine-room crew and a better average speed constitute some of the principal benefits gained by the conversion of steam to Diesel power of the 5,600 tons Shipping Board freighter ASHBEE. This vessel, operated by the Grace Line, has just completed her maiden voyage from New York to the west coast of South America and back, averaging 10½ knots in the Atlantic Ocean and 11½ knots in the Pacific. If such gains can be made with a vessel of this small size, it is obvious that they will at least be proportionately high with ships of larger tonnage.

America's Place in the World's Maritime Commerce

"TURNING to general conditions in the great countries with which we are more particularly connected by our services (Royal Mail Line), the desire on the part of the United States of America to participate in the ocean carrying trades of the world has been followed with universal interest. Great Britain has always viewed with friendly interest the desire of the United States to do an increased share of ocean transport. So far as this company and its associates are concerned, who for many years have contributed their share to the inception and building up of several trades from America to other parts of the world, we have always been and are desirous to collaborate and cooperate in carrying on services to and from American ports. We believe that, in the seven seas, there is ample room for all, and that with goodwill all can work together harmoniously for mutual benefit."—*Lord Kylsant.*

Navy Department Condemns Monel Metal Valves

IN an article appearing in the May issue of MOTORSHIP and dealing with "Nickel and Its Alloys Applied to Oil Engine Parts" appeared a paragraph describing one of the illustrations and reading, "Our illustration shows a monel metal valve which was used in submarine engines built by the United States Navy substantially according to the design of the M. A. N. works. Submarine service, it needs hardly be added, is about the severest there is and the use of entire valves made of this high grade material affords evidence of the fact that it has advantages possessed by few other materials."

While it was not intended that this should be construed as an unlimited endorsement of monel metal valves, officers of the New York Navy Yard have expressed the feeling that the statement in its present form was misleading to the engineering public and have requested the publication of additional facts supplied by them. According to a letter from Captain H. V. Butler, U.S.N., of the New York Navy Yard, "the valves in question were thoroughly tested in an engine on the test stand but failed for two reasons: First, the welded plug in the head, this being a water-cooled valve, could not be successfully welded. Second, seats pounded out and became pitted."

Application for a copy of the tests of monel metal valves made at the New York yard was made to the Bureau of Engineering and it is to be regretted that the refusal of the Bureau to supply these will make the complete engineering facts inaccessible to our readers at the present time. MOTORSHIP does not believe that monel metal has been unqualifiedly successful in oil-engine work or that its superiority is borne out by ample test and demonstration as yet. We do feel, however, that as a material for valve and other oil engine construction purposes it has inherent characteristics which should prove of value in overcoming some of the problems of design if it can be satisfactorily adapted to the requirements of this service.

It will be recognized that the Navy Department standards are not necessarily those of commercial oil engine work as evidenced by the official statement of the reason why the tested valves failed—the first of which is not one of the requirements of standard commercial practice and the second, namely pitting, is not in itself held to be undesirable. The subject is an interesting one for general discussion and we will be glad to hear from any of our readers who have experimented along this line.

Emergency Lighting Sets On Deck

"There was a sudden crash and in a few moments the lights went out"—was the story told by the passengers on the New York-New England route liner BOSTON after she collided with a tanker in a fog at night. This once again dramatically demonstrates the necessity for emergency oil-engined lighting-sets on the decks of all vessels, independent of the main engines, and of sufficient capacity to supply current for a series of powerful flood lights for the boats being launched as well as to operate the pumps.

Future Fuel Supply and the Motorship

DISCUSSING the two large passenger motor-liners ordered by the Royal Mail Steam Packet Company at the stockholders annual meeting, Lord Kylsant, Chairman, referred to the big and difficult problems before them, one of which was the question of the best and most economical system of propulsion for ships. He referred to a matter which has been frequently brought up by other shipowners which he stated may have great bearing on the issue. He said shipowners who decide to have their vessels fitted with oil-engines have to face the risk of their advantages being largely negatived by possible advance in the cost of oil-fuel in years to come, should the supply of oil run low. At the same time he indicated that the motorship has come to stay.

The latter really has a greater bearing upon the situation than has the possibility of fuel-oil cost increasing in the future. There are so many other fundamental advantages allied to the use of Diesel power in ships of all tonnages that the time will shortly be with us when shipowners will order motor-vessels without any question as to the alternative use of steam power. That the first cost of internal-combustion machinery may be higher than steam, or that the cost of operation may ultimately become greater, will not carry much weight. As Lord Kylsant says: "The motorship has come to stay." In many ways it is the ideal type of commercial vessel and this is gradually being internationally recognized by all shipowners.

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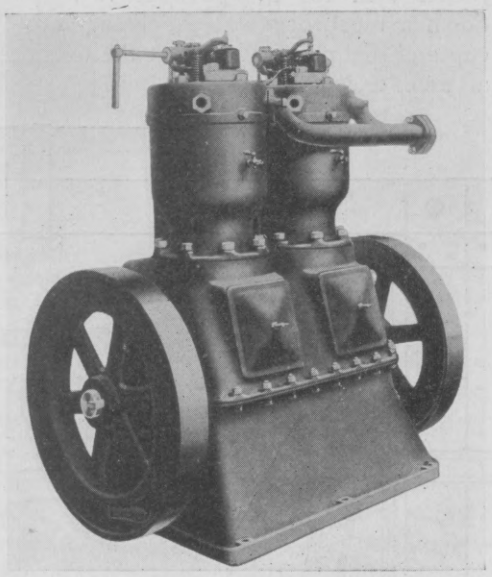
American Oil Engines on French Barge Canals

Concerning Numerous 14-b.h.p. Bates & Edmonds Hvid-Type Oil Engines, a Description of Whose Method of Working and Installation in French Canal Craft Having the Propeller Mounted on the Rudder Is Given Herewith

ADDITIONAL testimony on the possibilities of barge canals as a potential and actual field for oil engine applications is contained in a recently published news item about the shipment of fifteen American machines to France for this purpose. Owing to the fact that manufacturers here have not taken full advantage of the opportunities of home inland waterways and because of the oft-repeated assertion that there is no market for American engines overseas, the following account of an American firm's enterprise in disposing of engines in lots of fifteen at a time for canal work in France is bound to command attention.

Installation work is being carried out by a French firm while the oil engines are being furnished by the Bates & Edmonds Motor Co. There are many features of the undertaking which would be considered unusual from an American point of view, but which are more or less common practise in continental Europe. Builders of small and medium-sized oil engines over there have not been in the habit of distinguishing very sharply between stationary and marine jobs and are taking full advantage of quantity-production methods by designing their units in such a way that they can be used for either stationary or marine service with relatively slight changes.

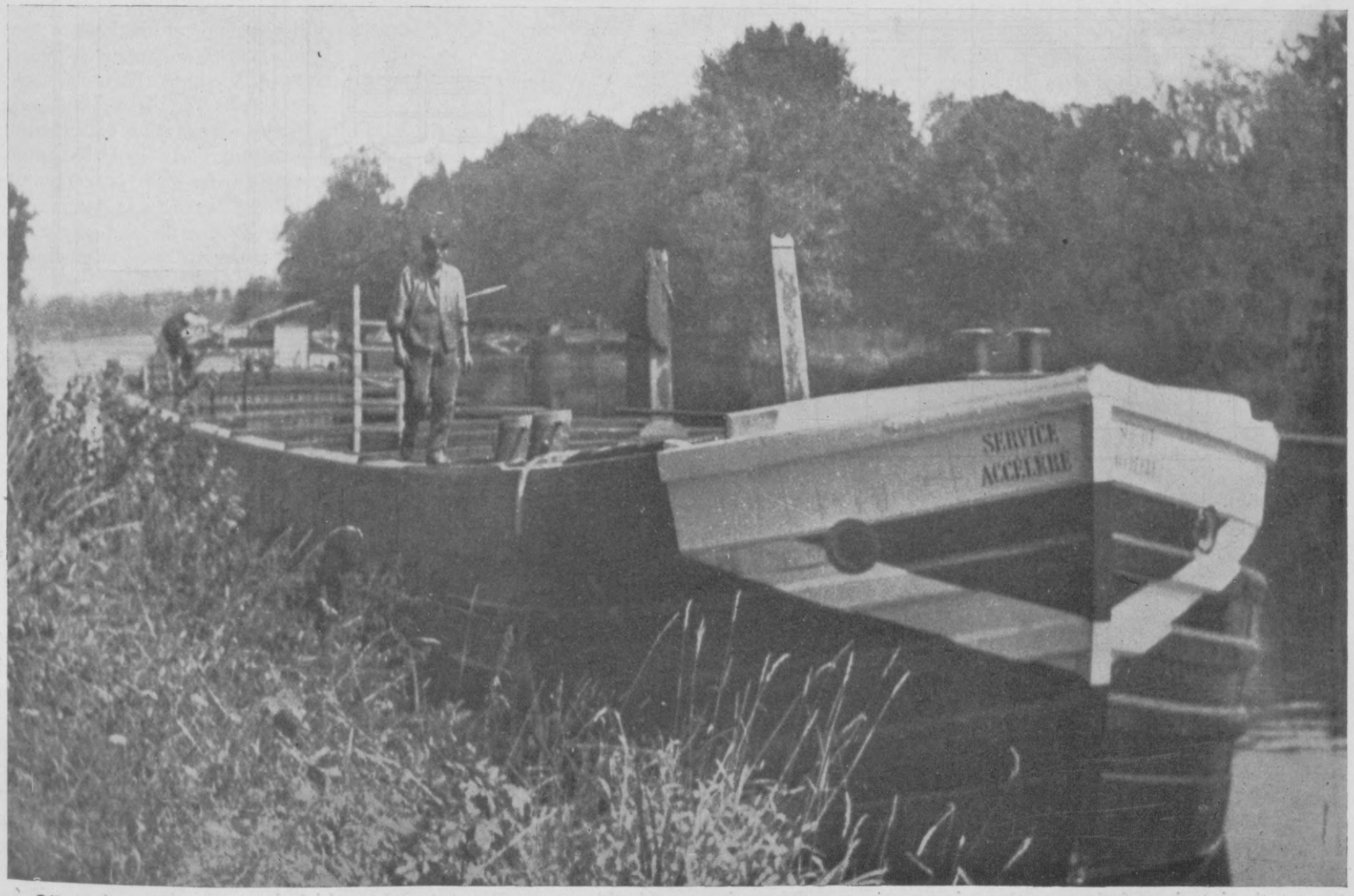
It is therefore a little easier to grasp why it is that the first Bates & Edmonds engines which have been shipped are of the stationary type. This machine operates on what is known as the Hvid or Brons system, which is characterized by the use of a small interior pre-combustion chamber and which is capable of being started cold without the use of a torch, spark, or any other exterior ignition means. In these respects the marine and stationary B. & E. engines are alike as they are in other essential particulars. For marine service a special bedplate, flywheel, and reversing clutch are fitted. Marine engines are also being used.



Some of the old wood barges have stationary type "Bulldog" oil-engines

Long pistons and connecting rods are used in these engines and the bearings are of ample surface even in view of the fact that a compression pressure sufficient for automatic ignition of the heavier oils is assured while starting from cold. Balance-weights are rigidly attached to a solid-forged crankshaft of generous proportions and good running qualities are assured. A spur-gear drive for the camshaft is contained entirely within the crank housing and is effectively lubricated. Mounted in the larger camshaft gear is a fly-weight governor which controls the fuel supply by a simple method to be described shortly. A lubricating pump located in the sump at the bottom of the bedplate feeds oil positively to all the major moving parts.

Unusual features of the cylinder con-



Oil engines "Made in the U. S. A." are being installed by the French transport company known as the "Service Accéléré." They operate 1,200 barges altogether, and are converting them to American oil-engine power by lots of fifteen as fast as they can be temporarily spared from the service

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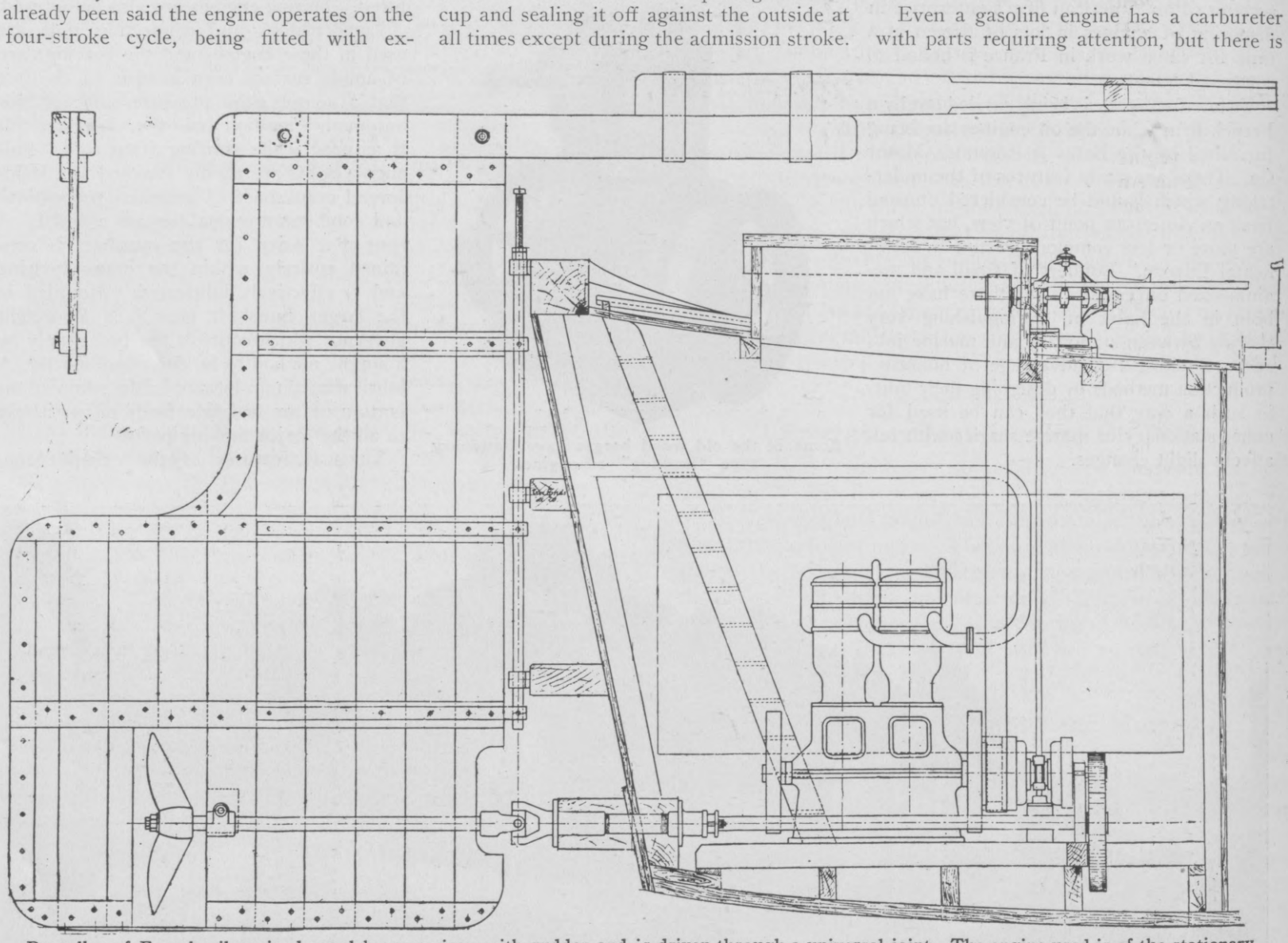
struction are the provision of an interior pocket for the location of the valve-lever push-rods. Owing to the generous dimensions of the water-jacket, a slight indentation in its outer wall such as is necessary for allowing the rods to pass still leaves plenty of water around the interior cylinder barrel and permits of giving the exterior of the cylinder a complete cylindrical shape which is pleasing to the eye. The practically complete closing off of the valve gear reduces noise and has the important practical advantage of keeping out dirt, water, and meddlers.

As may be surmised from what has already been said the engine operates on the four-stroke cycle, being fitted with exholes; air, on the other hand, which has been heated by compression, enters the holes and assists in the formation of a mildly explosive mixture. This is set off towards the end of the compression stroke attended by a pressure rise of not more than 100 lbs., in the cup alone. As the result of this the vaporized fuel still remaining in the cup is forcibly projected into the working cylinder where it burns substantially without rise in pressure.

Admission of fuel to the cup occurs by gravity whenever an extension from the rocker arm for the air-inlet valve pokes down a mushroom valve opening into the cup and sealing it off against the outside at all times except during the admission stroke. no fuel-injection valve either, simplifications of considerable importance

In some of the models, to be sure, fuel is stored in a separate compartment located in the base of the engine and from there is lifted by a small elevating pump to a level from which it can flow by gravity and aspiration to the governor-controlled needle-valve already described. But this is not a fuel pump in the generally accepted sense of the word and some kind of fuel oil transfer is fitted to nearly oil engine installations irrespective of size and without regard to the method of introducing fuel oil to the cylinders.

Even a gasoline engine has a carbureter with parts requiring attention, but there is



Propeller of French oil-engined canal barge swings with rudder and is driven through a universal joint. The engine used is of the stationary type and is connected by a belt and tightening idler to a warping winch on deck. Remote control for the engine clutch is provided

haust and inlet valves seated directly on a separate cylinder-head casting. In the design of the cam arrangement employed for operating them as well as in the overhead disposition of the valves, good automobile engine practice has been followed.

Fresh air only is drawn in and compressed like in most oil engines. Surrounded almost entirely by water-cooled surfaces and projecting only slightly into the combustion space is a steel cup having a series of holes at the bottom and serving as a pre-combustion chamber for the fuel charge. As the amount is so slight as only to wet the interior of the cup there is no chance of its running out through the small In the course of the latter a slight vacuum is created in the working cylinder which is communicated to the interior of the cup and thence past the mushroom valve to the fuel supply line. A needle valve in this fuel passage regulated by the governor already referred to controls the amount of fuel drawn into the cup in accordance with the load requirements of the engine.

A remarkable consequence of this arrangement, whose importance as an aid to simple and reliable operation can not be overvalued, is the elimination not only of high-pressure ducts, but also of the fuel pump. There is no such thing on a Bates and Edmonds heavy-oil engine. There is nothing equivalent to this, or to a fuel pump, spark plug, or magneto to encumber the appearance and operation of the B. & M. engines.

A further indication of the simplicity of operation of this type of machine is afforded by the fact that it can be hand-started even when built in multi-cylinder units. Compression-relief facilitates hand-cranking and the positive nature of the automatic ignition system is such that a single turn made on momentum after compression is thrown in suffices to make regular firing commence. It stands to reason also that an engine which is so simple to start will be correspondingly free from operating disturb-

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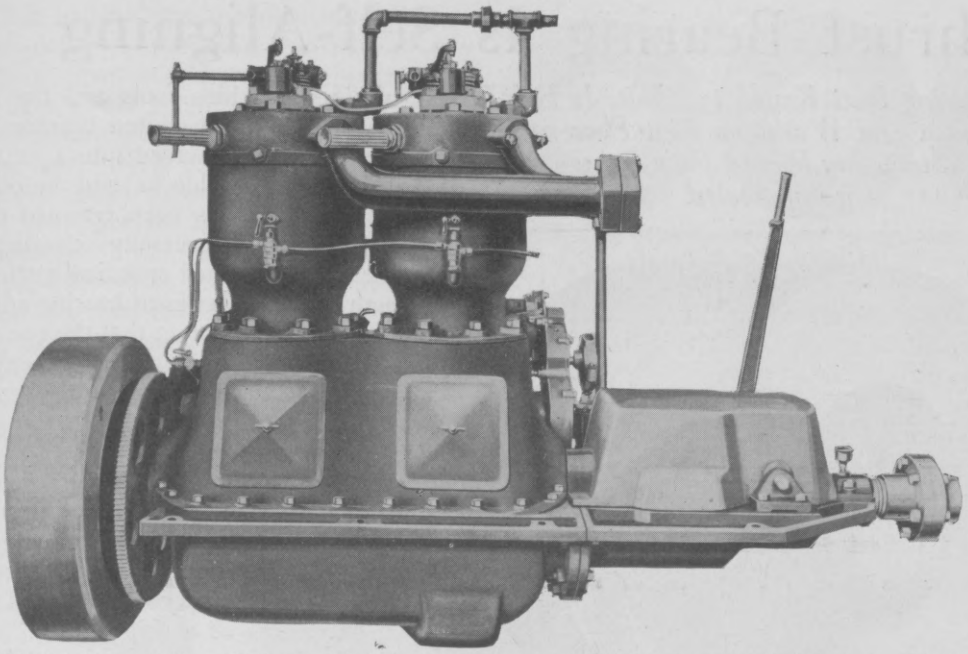


Marine heavy-oil engines of this type are being installed in the new steel barges of the "Service Accéléré," whereas stationary machines are being used on the wooden boats

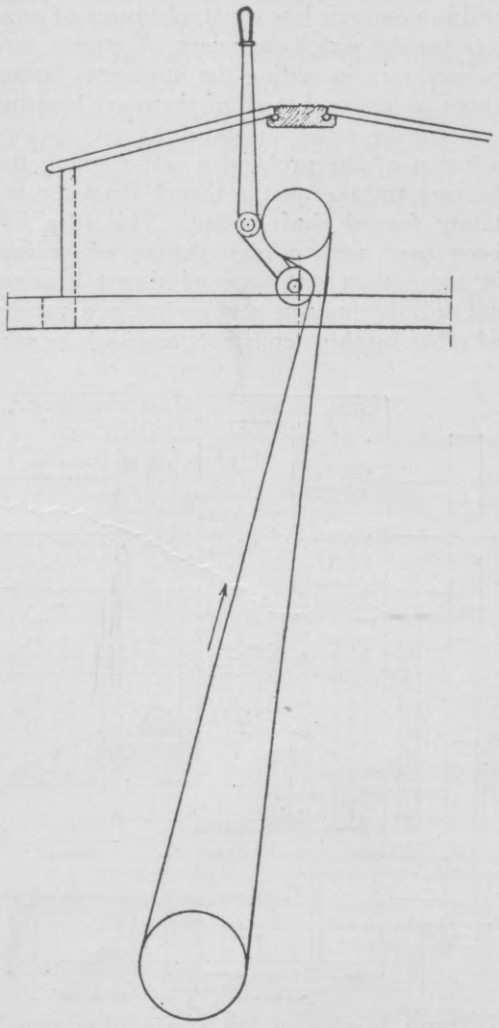
ances. Various makes of machines operating in the manner here described both in America and Europe have acquired the reputation of being tough, in the sense that they can stand operating misuse and neglect for a long time without suffering any damage.

Work-boats, fishing boats, and canal craft, which are operated under conditions that are sometimes trying for any kind of propelling power, offer a wide field of application to a prime mover having the characteristics just outlined and undoubtedly were a determining factor in the decision of the French canal transportation interests to use B. & M. engines in their fifteen barges.

Illustrations showing the details of one of these installations are reproduced herewith and give a good idea of the European way of arranging economical small-boat power plants. As has already been stated, the 14-b.h.p engine is of the stationary type and drives the propeller shaft through the medium of spur gears and a clutch furnished by the French owners. In order to avoid building too high an engine foundation, it was placed several inches away from the centerline of the boat so that the propeller shaft running back to the stern clears the flywheel on the starboard side.

It is apparent from the illustration that a somewhat unusual expedient has been adopted in fitting out this boat for the sake of insuring good maneuvering qualities. Attached to the outboard end of the propeller shaft is a universal joint through which motion is communicated to another shaft mounted on the ample rudder characteristic of canal craft. It is the last-named shaft on which the propeller is actually mounted and it turns in a gap cut for the purposes in the rudder planks. Consequently the jet of water set in motion by the propeller is directed towards one side or the other, partaking as it does, of all of the tiller movements. The boat is therefore under the influence not only of the normal steering effect of the rudder, but its stern is also energetically shoved to this side or that in such a way as to rotate the entire boat in harmony with the direction given to it by the tiller. Anyone who has ever steered a rowboat with an Evinrude motor on it can fully appreciate the effect of putting a directional propeller on power-driven craft. It is a device that gives an interesting answer to the question as to whether single or twin-screw power should be adopted for canal work.

A direct comment on the good running



Hand-lever on tightening idler of warping winch belt drive takes place of auxiliary power for deck machinery

qualities of the engine is the fact that it is installed in the crew's living quarters along with the bunks and the galley stove. The space formerly occupied by animals as long as the boats were horse-drawn now represents a clear gain in cargo-carrying capacity and constitutes the only case known to our records in which the substitution of modern oil engine power for more antiquated propelling means was accomplished with a 100 per cent saving in engine room space.

We have heard of steam driven deck auxiliaries and of electric-driven ones but this French canal boat also teaches us how deck-auxiliaries may be belt-driven from the main engine. As may be seen from the end elevation, a tightening idler with a hand-lever on it serves to throw a warping winch in or out of action as the conditions of mooring may require. For low first cost it probably would be difficult to match.

In addition to the simplicity of operation by which the engines to be installed are characterized, the decision to use them was undoubtedly given impetus by the saving in operating costs. Without burdening our readers by citing figures in terms of liters and francs in the attempt to itemize the elements that go to make up French operating cost, we sum the matter up by stating that the saving estimated by the operators is in the ratio of 70 centimes to 4 francs. In other words, the oil engine lops off about 5-6 of the present get-a-horse transportation bills.

Additional Bates and Edmonds engines are being used by the French Government to furnish lighting current to the railroad stations in the remote districts of Algiers, a region in which the operation of prayer-wheels by the natives is about the nearest approach to internal-combustion engine operation which has been known there. We have been informed also, that auxiliary lighting sets of this make are being installed on several Diesel-electric tugs under construction for the Atlantic Refining Company, the first of these to go in service being the VAN DYKE I.

"Silverpine" in Port

Our recent inspection of the Roosevelt Line's new Neptune engined motorship SILVERPINE yielded many new features of interest and a full description will be published in an early issue. Notable among the arrangements which were observed are the crack-proof construction of the main engine cylinders and heads and its open-type crossheads, not to mention a Star contra propeller to be affixed at the next dry-docking, a Ramsay governor, new type of oil purifier and a neat design of exhaust pyrometer.

Coast Guard authorities have specified Shipmate ranges for the 175 boats to be used as rum chasers, being built on Atlantic, Pacific and Lake coasts. Several shipments of ranges for these boats have already been made.

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Single-Collar Thrust Bearing Is Self-Aligning

Rotating Part Keyed to Shaft, Is Babbited and Works on Flat Face of Stationary Pinned Ring Spherically Seated

THE thrust bearing on a ship is the focusing point of the propelling forces which act upon it. It is located at that part on the hull where all the forces for driving it may be considered as being concentrated. If instead of a turning propeller shaft a non-rotating column were to be placed with one end abutting against the thrust saddle and the other end attached to a second ship in motion, the effect would be exactly the same as though the first vessel were being driven by its own propeller and shaft in the usual manner.

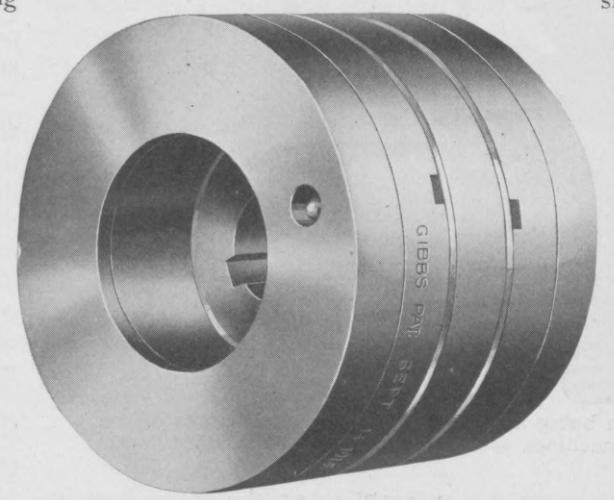
Tying-in the thrust forces to the hull of the ship is the problem of the naval constructor; he must be careful, above all, to insure that the thrust saddle is secure to the keel and plating in such a way that the forces which are radiated to them are subdivided into a great many small components. If the webs and gussets which support the thrust bearing do not extend far enough, the thrust saddle is likely to be deflected in such a degree that the shafting cannot be held in line.

In designing the thrust bearing the engineer has to deal not only with the static push of the shaft, but also with the fact that it is rotating at the same time. The entire force for driving the ship, although stationary relative to the hull and in the direction along which it acts, comes through a member which is actively rotating. How to take up this force without allowing it to produce excessive friction and possible damage is the problem of the thrust bearing designer.

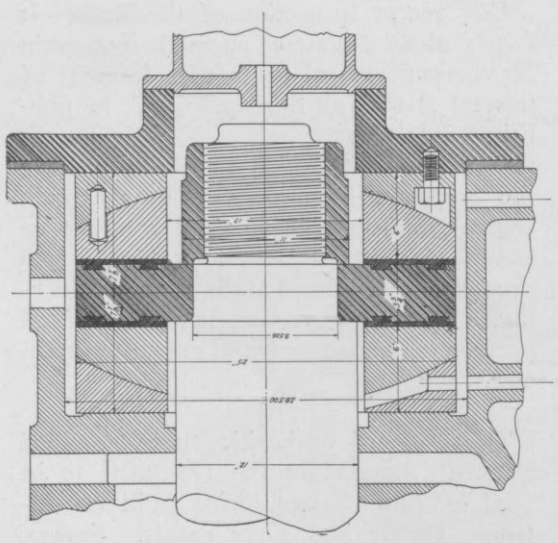
As a solution of this problem the old multiple-collar horseshoe thrust bearing has long ago become well known. Owing to its extreme sensitiveness to minute misalignments, bearings of the rigid type have had to be run at pressure intensities so low that large numbers of collars had to be provided. A cylindrical bearing accommodates itself much more readily to misalignment and the difference in diameter between shafts and journals (clearance) automatically produces a slightly wedge-shaped oil film adaptable to being positively drawn in between the surfaces. Inaccuracies far too slight to be measured are sufficient to prevent two flat surfaces from floating on an oil film between them, a fact which has caused the rigid horseshoe thrust, in spite of its enormous area, to acquire a reputation for being cranky. It takes up more than its share of space in the engine room and is a more or less constant source of anxiety for the watch engineers. Extreme care is necessary in setting the numerous horseshoes to insure that all of them are bearing.

Common sense indicates as an obvious solution of the problem a self-aligning flat bearing to take up the thrust from the rotating forged shaft collar. This idea has been used with a high degree of success in more than one type of thrust bearing, not only for marine service but in a variety of other machine constructions such as vertical turbines, machine tools and the like. In some designs the babbited bearing surfaces have been subdivided into a number of individual tilting blocks and in others the thrust surface has been retained on a single piece made universally self-aligning by means of matched spherical surfaces. In both of these classes of bearing advantage is taken of the fact that the two surfaces moving relatively to each other with an oil film between them naturally tend to "float" on the film, provided that at least one of them is free to set itself at that angle to the other one which the conditions of oil pressure and motion demand. An important feature of the self-aligning bearing is its immunity against deflections such as are inevitably communicated to it by the straining of a ship's hull.

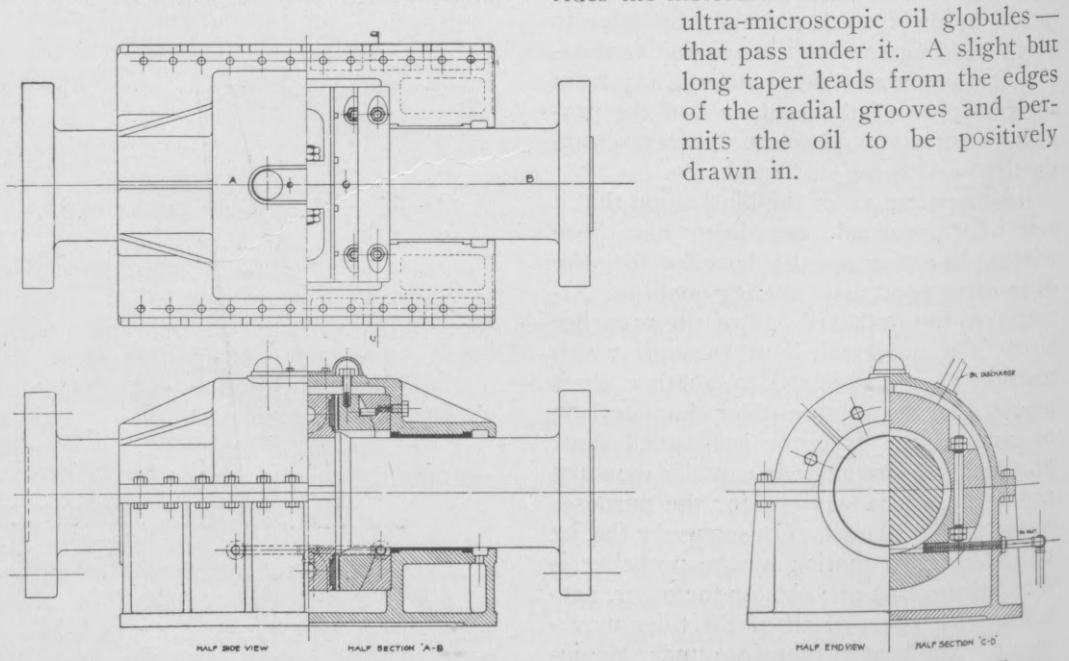
The floating shoe permits the establishment under all conditions of an oil film fully determined by surface tension, which can be made to resist enormous forces. To squeeze a capillary layer of oil out from between two surfaces is extremely difficult so long as there is no "cocking." If the surfaces become tilted, say, by some unsymmetrical force, the film is at once destroyed and the expulsion of the oil is readily accomplished. No matter how rigidly a horseshoe thrust may be built and how perfectly it may have been aligned in the first place, strains and temperature distortions are bound to affect it. Powerful though the uninjured oil film may be in the unimpaired condition, it is quickly put out of commission by anything that disturbs its symmetry. So long as this is maintained, the rigid metal particles of the two surfaces are prevented from coming in contact with and abrading one another. All the necessary displacements for accommodating the motion are taken up within the oil film and there is more truth than poetry in the statement that the self-aligning thrust collar rides the molecules—numberless billions of ultra-microscopic oil globules—that pass under it. A slight but long taper leads from the edges of the radial grooves and permits the oil to be positively drawn in.



Compactness is a feature of the single-collar thrust bearing



Oil enters at top and is forced by pressure to escape past the babbited ring



Thrust bearing of the single-collar type used on the "Seekonk." Spherical seating allows thrust-ring to float on oil-film under all conditions. By fully utilizing surface-tension, the collar is made to ride the molecules of oil

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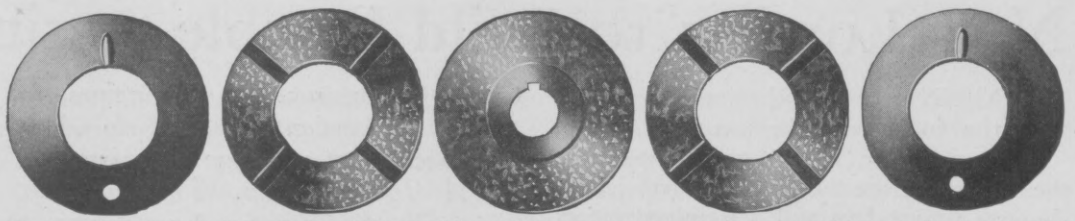
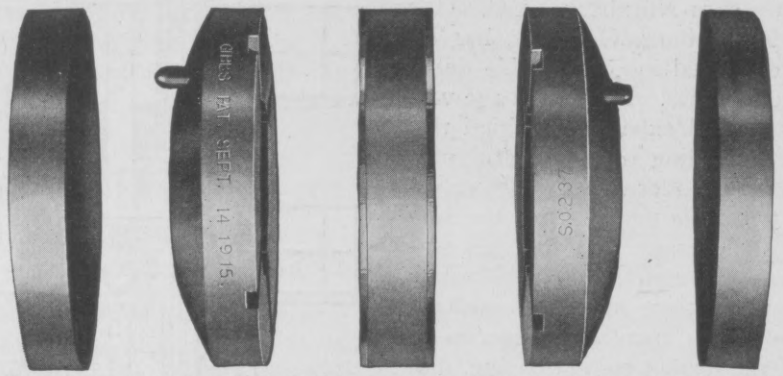
That is why it is possible to make the single-collar self-aligning bearing do the work of a ten-collar horseshoe thrust. The use of a single collar is in itself an enormous advantage because it eliminates the hair-trigger work involved in setting two or more collars to bear equally.

In the light of these considerations it is apparent how far the rigid horseshoe bearing falls short of the best that can be done. The fact that it has persisted for so long and has received such wide-spread application to ships is due to the ingrained conservatism of steam engineers rather than to the lack of types of bearings built according to modern engineering principles.



Center ring is keyed to shaft. Rings with radial grooves are stationary and have spherical backs which permit them to tilt with respect to the two outer seating rings

between collars turned on the shaft. Body-bound stud bolts are used for securing the halves together, one of which is keyed to the shaft. Since the actual thrust force is communicated to the turned shoulders, the bolts have only nominal loads to carry.



Only the central babbited ring rotates. The two pinned stationary rings have separate spherical seatings

It is not surprising to find that those persons who have been progressive enough to adopt oil engines for ship propulsion have also the foresightedness to use single-collar thrust bearings of the self-aligning kind.

As a practical example of such a bearing attention is drawn to the Gibbs marine thrust block, of which illustrations are reproduced herewith. Referring to the cross-section, it will be seen that the rotating collar, instead of being an integral part of the shaft forging, consists of a split ring held

In case rebabbiting should ever become necessary, the split ring would have obvious advantages. Putting the babbit on the rotating member is one of the essential respects in which this bearing differs from the horseshoe thrust.

Consisting merely of steel discs having a flat face on one side and a ball surface on the other, the stationary members can also be made in halves for ready assembly and dismounting. In order to avoid machining a spherical surface on the main casing of the thrust, a separate ball seating is provided for accommodating and backing up the actual thrust plate above referred to. The concave seating ring is also split and can be readily taken out sideways. The end view of the cross section clearly shows the construction of the concave spherical ring and indicates the method of lubrication which is employed.

Oil under pressure is used for this purpose and enters a large ring-space formed by the shaft and the large hole in the seating ring which surrounds it. Axial grooves cut along the hole in the thrust plate allow the oil to pass to the babbited surfaces on the rotating ring, and its only means of escape is along radial grooves provided for the purpose. As a result of this arrangement oil is very positively supplied to the point where it is needed.

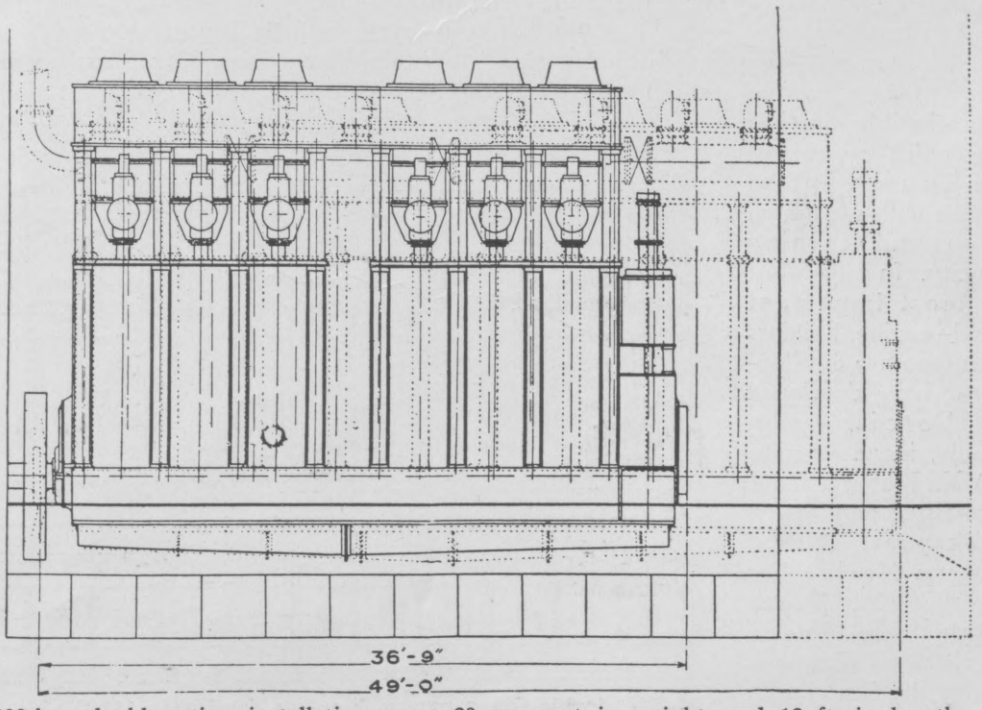
To take both ahead and astern thrusts, spherical collars and aligning rings are provided on both sides of the shaft collar and a pair of ordinary steady bearings are also accommodated in the housing. Even so it is readily apparent to the eye that the arrangement is considerably shorter than an equivalent horseshoe thrust would be.

A bearing of this kind was installed on the motorship SEEKONK when she was converted and has contributed its share to the brilliant records which this vessel has been piling up ever since the conversion was carried out.

Discussion of Double-Acting Engine

In a recently published paper, G. J. Lugt of the Werkspoor Works and Harry Hunter of the North Eastern Marine Engineering Co., Ltd., analyze and discuss the outstanding features of the new Werkspoor double-acting design, of which a description is printed on another page. Among other things, they discuss the effect of using a larger clearance volume and hence lower compression for the bottom end and bring out the fact that this practise makes available for combustion a greater percentage of the entrapped air. Corresponding to a compression of 250 lbs. per sq. in. is a volume of 3 cu. ft., 0.7 cu. ft. of which are so situated as not to come in contact with the injected fuel. Accordingly, only about 23% of the air is lost, whereas if the clearance volume had been made small enough to give the usual compression of 400 lbs. or more, 35% would have gone out of commission.

Airless injection is also matter with which the North Eastern-Werkspoor Company is concerning itself. They are working on a system developed by Professor Arschaouloff which is characterized by the use of a differential oil and air piston actuated by the compression and producing an airless spray at 4,800 lbs. per sq. in.



2,000-h.p. double-acting installation saves 20 per cent in weight, and 12 ft. in length, as compared with equivalent single-acting power plant

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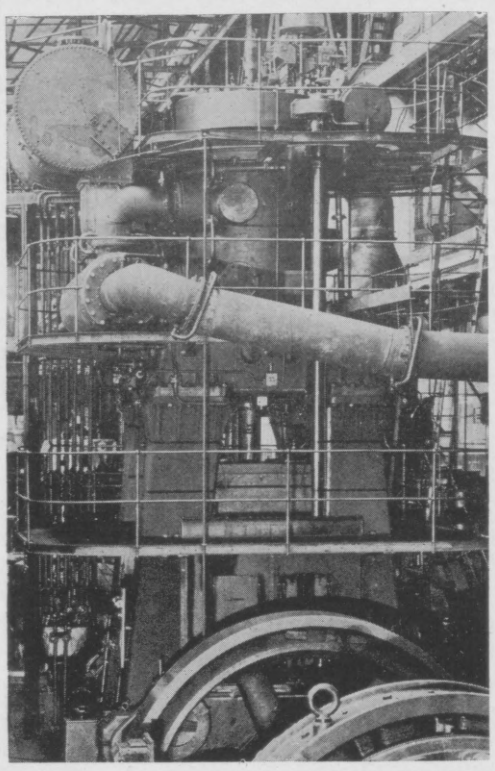
New London to Build Double-Acting M.A.N. Diesels

Cost of Construction of Engines for Ship Conversion Expected to Approach That of Steam Machinery. A 15,000 s.h.p. Two-Cycle Diesel Ordered in Germany

BEGINNING with the introduction of the four-cycle single-acting Diesel engine for cargo-ship propulsion, the history of the subsequent development shows a progressive and determined effort to reduce first cost and capital charges, and to increase cargo and earning capacities by reducing the length and weight of engines without sacrificing the essential degree of reliability and robustness. These underlying considerations largely account for the steady progress made in the development and introduction of the single-acting two-cycle engine of conventional design followed by the opposed-piston type of two-cycle engine, both of which are now widely accepted as satisfactory from the point of view of operation.



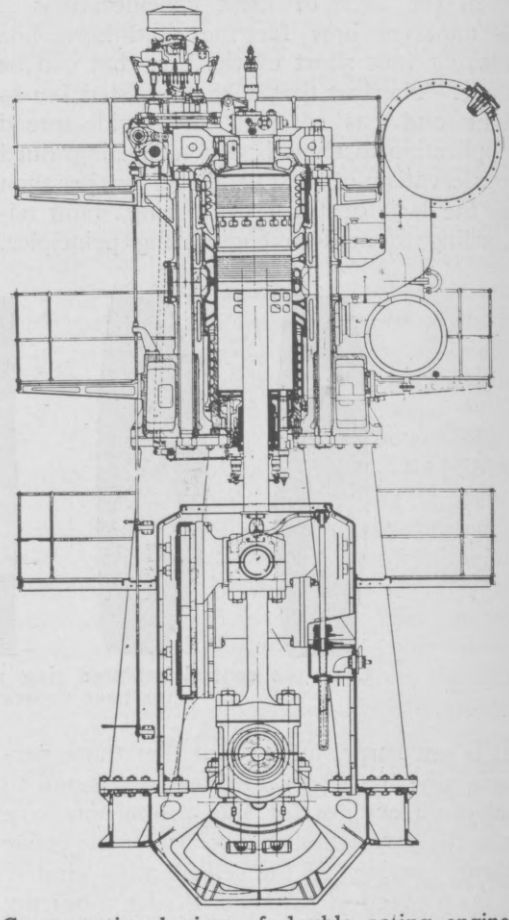
Double-acting two-cycle engine developing from 1,000 to 1,200 b.h.p. in a single cylinder

Many engineers have long held that the ultimate engine within vision is the two-cycle double-acting type which combines minimum capital charges with maximum cargo and earning capacity. In fact, all of the most important Diesel-engine builders in Europe are developing or have developed a double-acting engine, notably, in addition to M.A.N., Blohm & Voss, Burmeister and Wain, Werkspoor, North Eastern Marine Engineering Co., North British Diesel Engine Works, and Krupps. To-day half a dozen domestic builders are at work on double-acting oil-engines endeavoring to make up for lost time, and with a view to shortly advancing ahead of Europe in the characteristically American way.

The development of a two-cycle double-acting marine Diesel engine by the Maschinenfabrik Augsburg-Nürnberg, A.G. (the M.A.N.), of Augsburg, Germany, has already been described in considerable detail in our previous issues. In view of the vast amount of practical experience behind this development, including the successful production of a six-cylinder 12,000 s.h.p. valve-scavenging, two-cycle engine type, the success of the final design, viz., the port scavenging type, was confidently anticipated. That these anticipations have been realized is shown by seven months of successful operation of the demonstration engine, diameter 31-½", stroke 41-⅜" which, at 100 revolutions, consistently develops 1,078 s.h.p. on a fuel consumption of 0.41 lb. per b.h.p. hour.

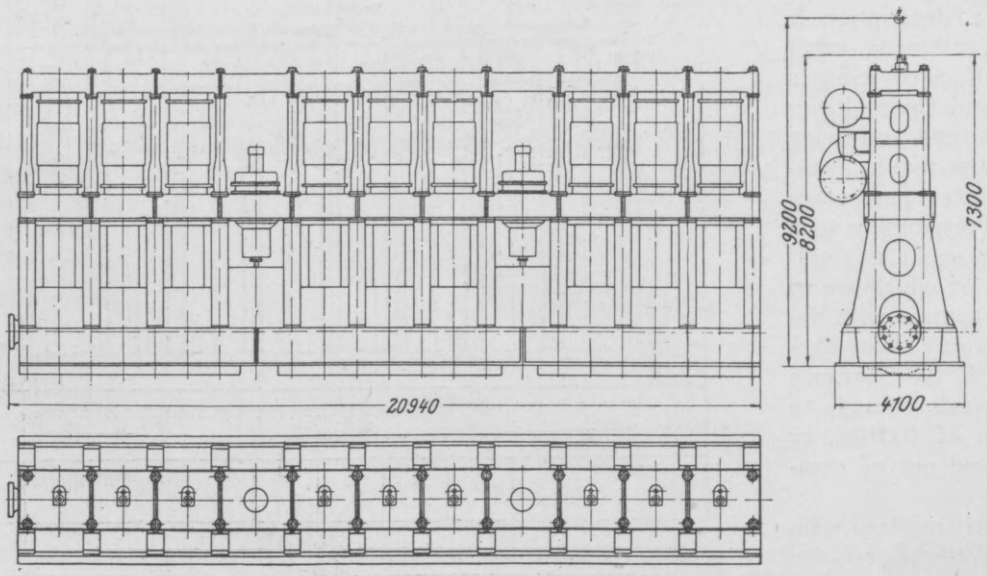
After having witnessed the tests of this engine and examined the details of the design, many Diesel engineers of wide experience have pronounced it to be a demonstrated success which has definitely passed out of the experimental stage. Among these engineers were those of The New London Ship & Engine Company (licensee in the U. S. of the M.A.N. since 1910) who, in arriving at their conclusions had the benefit of their own practical experience with this type, based upon the construction and tests at their Groton plant of two experimental engines of smaller dimensions—one two-cycle and the other four-cycle, both double-acting.

With a view to providing American shipowners with oil-engines of the most modern and most efficient type at the lowest possible production costs, The New London Ship & Engine Company has decided to build the Augsburg double-acting two-cycle marine Diesel engine, taking immediate advantage of the very latest European experiences.



Cross-sectional view of double acting engine showing arrangement of valveless scavenging ports

As the weight of such engines for cargo-ships is under 200 lbs. per s.h.p. compared with 300 lbs. to over 400 lbs. for single-acting four-cycle units, the whole question of production becomes a matter of cents per pound. It is expected that the cost will be lowered to about $60 per shaft horsepower, or approaching very nearly to steam plant costs. Such engines will be built under the firm's usual guarantees. In addition to its engine construction facilities, the company has docks for the conversion work both at New London and at Newark Bay, so are in a position to handle the complete job.



M.A.N. double-acting two-cycle engine developing 15,000 s.h.p. in nine cylinders at 100 r.p.m. Length, 67 feet 6 inches; width, 13 feet 6 inches; height, 26 feet 11 inches

While the approval of a new development of the double-acting Diesel by competent engineers is an excellent evidence of merit, its general acceptance normally awaits the approval of capital in the way of substantial

(*Continued on page 597*)

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(*Continued from page* 592)

orders. In this instance support is given by the Augsburg works of the M.A.N. having recently been given an order for a marine Diesel engine of 15,000 shaft horsepower for a passenger liner, which is the largest commercial oil-engine yet ordered in any country.

Details of this big engine have not yet come to hand, but it will be seen that there are nine double-acting cylinders with direct drive for the scavenging air pumps. In this connection, it is interesting to note that the power per cylinder will be slightly more than double that required for cargo-ship engines in three and four-cylinder units.

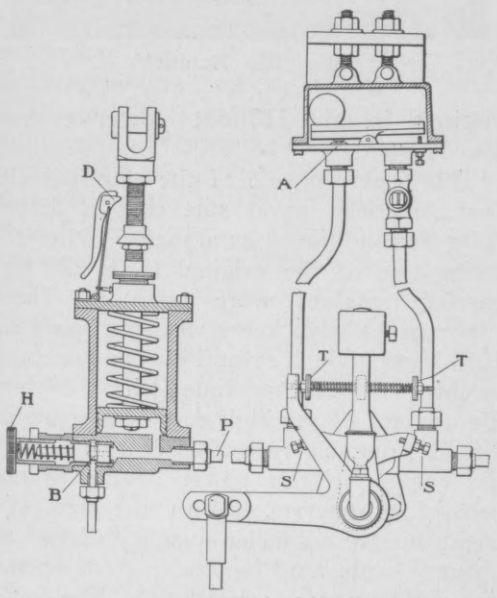
But the new design departs from the method of construction used on the experimental cylinder, and differs from it in that it possesses important advantages in respect to simplicity of construction, accessibility of the cooling-water spaces, ease of removing piston and cylinder, and greater stiffness of the engine structure. The stiffness of the entire engine is insured by two box-entablatures or girders, running the entire length on which are mounted the cylinder jackets, which are free to expand towards the center. Cylinder heads are likewise secured to these girders so that the transmission of the forces takes place by the shortest possible path through the girders and from them through forged tie-rods to the bed plate.

With regard to cargo-ship engines, it is of special interest to note that Blohm & Voss, the well known German shipbuilders, who are also licensees of the M.A.N., have received an order from the Hamburg-American Line for a three-cylinder double-acting cargo-ship engine, diameter 27.5", stroke 46.25", to be installed in the ALTMARK, a ship now equipped with steam power. The standard cylinder size selected by the New London Ship & Engine Company for cargo-ship engines in three and four-cylinder units is diameter 27.5", stroke 43.25". With this cylinder, variations in revolutions from 80 to 100 give a range of shaft horsepower in three and four-cylinder units is,—diameter mately 1,800 to 3,000. The longer stroke adopted for the Blohm & Voss order is due to special requirements as to low revolutions, the engine operating at 75-78 r.p.m. On account of the Government program for the conversion of Shipping Board steamers, the appearance at this time of this advanced type of engine is of great interest to American shipowners.

Double-Impulse and Anticipating Governor

Advance Action and Inertia Impulses from Back and Forth Strokes Are Used in Connection with Air-Relay

Overspeed and emergency governing of marine oil engines is accomplished by modifying the action of the fuel pump. Owing to the small size of the individual fuel charges which are pumped, light simple mechanisms can be employed and a stoppage of the fuel instantly deprives the engine of the energy supply which is necessary for



Air-relay governor. If the oscillating weight hits screws S (either one) air reaches P and raises piston

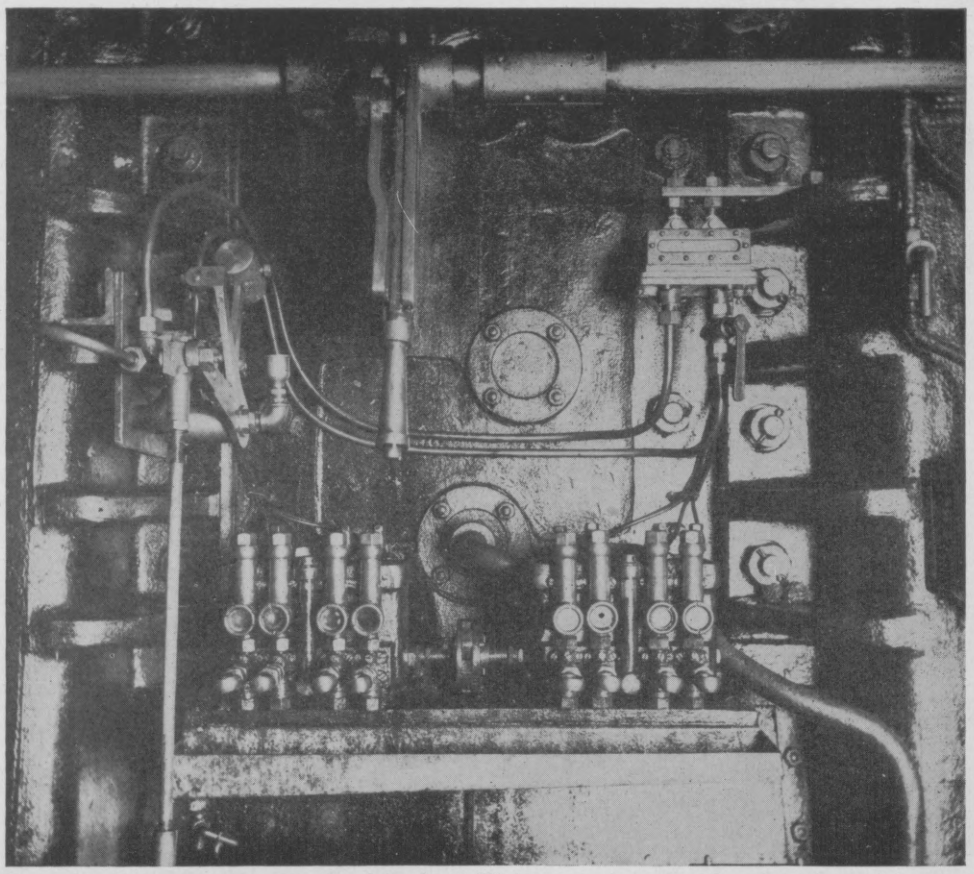
overspeeding. In the case of a triple expansion steam engine the vacuum as well as the steam present in the intermediate piping and receivers does not come under the control of the throttle, with the result that it cannot be stopped nearly so promptly. Precise regulation can be secured for the Diesel engine with considerably greater ease.

Among the most interesting of the speed-regulating devices that have recently been perfected for guarding against dangerous speeds at sea is the Ramsay governor.

Since it operates by means of an air relay, it is more than capable of being adapted to any of the existing means for influencing the discharge of a fuel pump, quite irrespective of the amount of force that may be demanded. A push of 1,000 pounds or more is readily obtainable on the spindle of the air cylinder.

Acting as it does on the well-known inertia principle, it is characterized in addition by two distinctive features. One of these is that it is capable of delivering two inertia impulses per revolution of the engine and the other is that it acts in advance to reduce fuel supply before the propeller actually gets out of the water and restores the supply before the wheel is again fully immersed. As a consequence of these two features it is better suited to maintain evenness of operation than those devices which are single-acting and which operate only after the effects which they are to correct have become pronounced.

Referring first to the line drawing there will be seen a set-screwed weight which is oscillated by means of springs from some drive taken from the fuel pump gear or other part that reciprocates in unison with the engine. If a rise in speed occurs, the swing of the weight becomes sufficient to actuate both of the two tappet screws that limit its travel. Since the screws are attached to a valve, any displacement of which from the central position causes a flow of air in the tube on which it is located, it is plain that an air pressure impulse



Governor mounted on cross-head back of Vickers engine. At the right is anticipating device containing balance and ball-weight for control of air-valve as ship pitches

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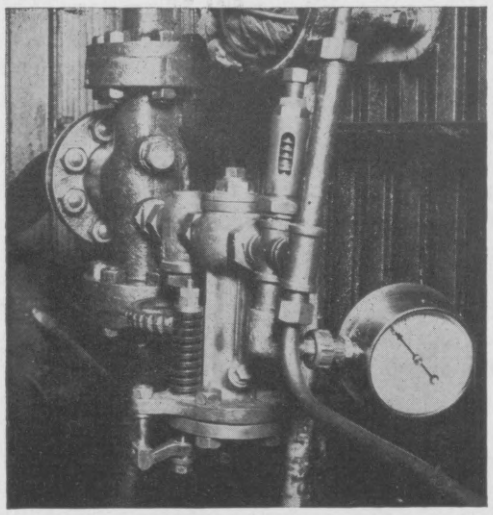
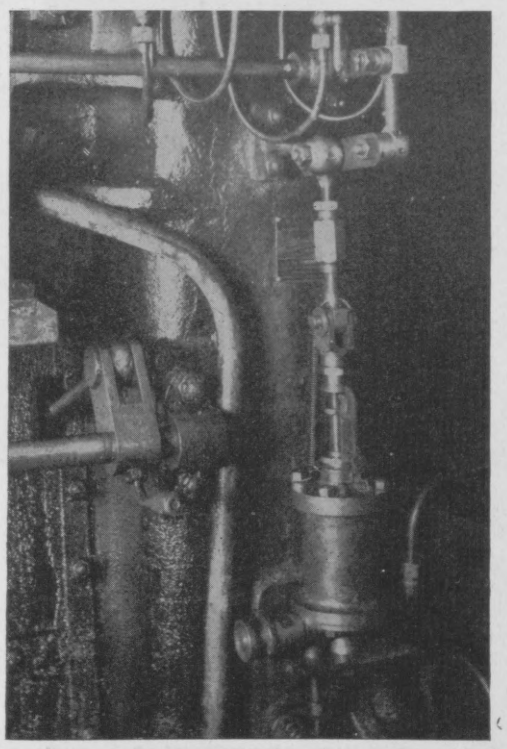


Reducing-valve furnishes air at low pressure for operating governor relay

will be set up in the tubing at each blow from the weight. Air for this purpose is taken by means of a valve reducing to 25 lbs. per sq. in. from some permanent source of supply such as a starting pipe.

Air pressure is thus communicated to a small cylinder containing a piston attached to the fuel cut-out mechanism on the fuel pump. A small spring loaded pilot valve first allows a fraction of the air impulse to escape to the atmosphere, but in doing so it moves to the left and automatically closes the atmospheric vent. The rest of the air impulse spends itself in moving the piston and thereby interrupting the fuel supply, after which the spring on the pilot valve returns the latter to the vented position and allows the air in the system to escape. Owing to the fact that the small spring is under the control of a hand screw and jam nut, it can be set in such a way as to give the proper travel to the piston.

Should the weight strike a particularly heavy pair of blows, more air is allowed to pass, the piston rises higher and catches under the pawl shown on the outside. This



Attachment of relay-piston to fuel-pump cut-out gear

is what would happen if the propeller should come loose or the shaft should break. The complete stoppage of the engine would give warning to the operators and would effectively prevent the machine from "running away." For ordinary racing conditions due to a variation in load such as may be caused by a following sea, the double air impulses accompanied in each case by an automatic return of the piston are sufficient to maintain practically normal speed.

The most noteworthy feature, by virtue of which excesive speed fluctuations are prevented even from arising, consists in the anticipating valve shown near the top of the line drawing. When the vessel pitches forward preparatory to thrusting the propeller out of the water, the ball on the balance-lever valve, which is mounted in a fore-and-aft position and which may be adjusted to any trim of the ship, rolls to one end and admits air to the piston irrespective of the position of the inertia weight. When the ship rights herself before reimmersing her wheel, the ball rolls back and the vent-valve allows the piston to come back and to re-establish the fuel supply even before a serious drop in speed has occurred. Excessive speed fluctuations are thus eliminated and the possibility of making better mileage even in the face of heavy weather is considerably enhanced.

Vessels which have been thus equipped and which have been giving a satisfactory account of themselves are the SCOTTISH MAIDEN, SCOTTISH STANDARD, SCOTTISH MINSTREL, and SCOTTISH MUSICIAN, all propelled by Vickers airless injection engines. Two-cycle air-injection engines similarly protected are those of the SCOTTISH BORDERER, SILVERPINE, and IOSSIFOGLU. Because of the double-impulse feature of the Ramsay governor its sensitiveness is sufficient to make it suitable for a good many classes of stationary work. It is being marketed in the United States by Charles Cory & Son, Inc., New York, N. Y.

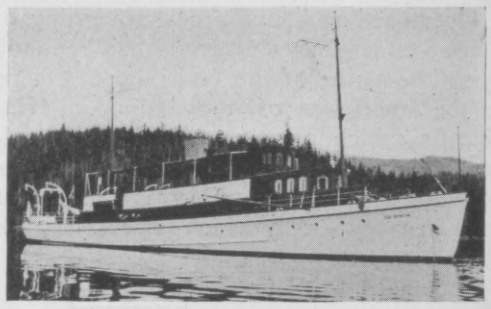
From the View of an Oil Company

"I have always considered the burning of oil under boilers a wickedly wasteful use of a product that is not too abundant, and I look forward with confidence to the time when its adoption for marine purposes will become practically universal." This eloquent appeal for motorships came from the lips of Sir Charles Greenway, Chairman of the Anglo-Persian Oil Co. on the occasion of the launch of a 10,000 tons Diesel-driven tanker at Jarrow, for the British Tanker Co's. fleet.

"Some of you," said Sir Charles, "may wonder that the Anglo-Persian Oil Company—a company whose interest it is to encourage the use of oil fuel, particularly oil of a light gravity suitable for use in internal-combustion engines such as is Persian oil fuel—should be so late in the adoption of Diesel engines for the motive power of its fleet. The explanation is that our shipping director Douglas Stewart, considered it advisable, in order to build up our tanker fleet as rapidly as possible, to postpone the adoption of the heavy-oil engine until all the initial difficulties had been overcome, and an engine as reliable as possible has been evolved. The fact that he has now decided to adopt this type of engine in our own tankers is to my mind the best possible evidence that its superiority for marine purposes has been indisputably established. As some of you are aware, I have for many years past been a strong advocate of the Diesel engine. To-day therefore marks for me the realization of one of my most ardent hopes because the Diesel engine has been sufficiently perfected to even satisfy Mr. Stewart."

Yacht "Rio Bonita" Converted to Oil-Engine Power

A. Melville Dollar, Admiral of the Pacific International Yachting Association and Vice-Commodore of the Royal Vancouver Yacht Club, has placed an order for twin Vickers-Petters surface-ignition oil-engines of 100 s.h.p. each, to replace the gasoline



The "Rio Bonita"

engines in his 110-foot power cruiser RIO BONITA.

This boat was one of the standard 110 foot American naval sub. chasers before being re-conditioned as a yacht. After refitting two of the original three 220 h.p. gasolene engines were retained. These two engines gave her a cruising speed of 10½ knots, though several knots more could be obtained for a short time by hard driving. On account of the high cost of gasoline in British Columbia (about 25 cents a gallon) gas engines of this power have been expensive to operate. With the new oil-engines using a smaller quantity of fuel at about 7 cents a gallon the cost of operation will be very much reduced. The four-cylinder 9″ by 10″ Vickers-Petters units that will be installed are two-cycle engines with base compression of scavenging air and develop their rated load at 375 r.p.m. They will drive new bronze four-bladed propellers of 39″ diameter and 45″ pitch; with which it is expected she will easily maintain a cruising speed of 10½ knots or better. An 8 h.p. auxiliary Petter oil-engined compressor set will be installed.

Several other converted sub-chaser yachts have already been changed to oil-engined power on the Pacific coast; the TENINO of Seattle being equipped with twin 65 h.p. Atlas-Imperial Diesel engines, and the CONQUISTA of Los Angeles with twin 65 h.p. Fairbanks Morse oil-engines.

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The "Glory" Commissioned

In Active Demand by Sheepshead Bay Fishing Parties

With her steam machinery torn out and replaced by a 360-s.h.p. Bessemer Diesel engine, the GLORY has been converted into the most desirable one of all the vessels that make up Captain David Martin's Sheepshead fleet. She will shortly be rivalled for this place of distinction by his GIRALDA, which is having her steam engine and boiler replaced by a 420-s.h.p. oil engine of the same make.

Owing to the rapid growth of New York's population, the demand for fresh-air recreation places like Sheepshead Bay is rapidly increasing and an attractive business is being done in taking fishing parties out to sea in passenger boats of the kind typified by the GLORY and the GIRALDA. Needless to say, the dollars-and-cents value represented by the economies and operating conveniences of these boats are a direct entry on the profit side of Captain Martin's ledger.

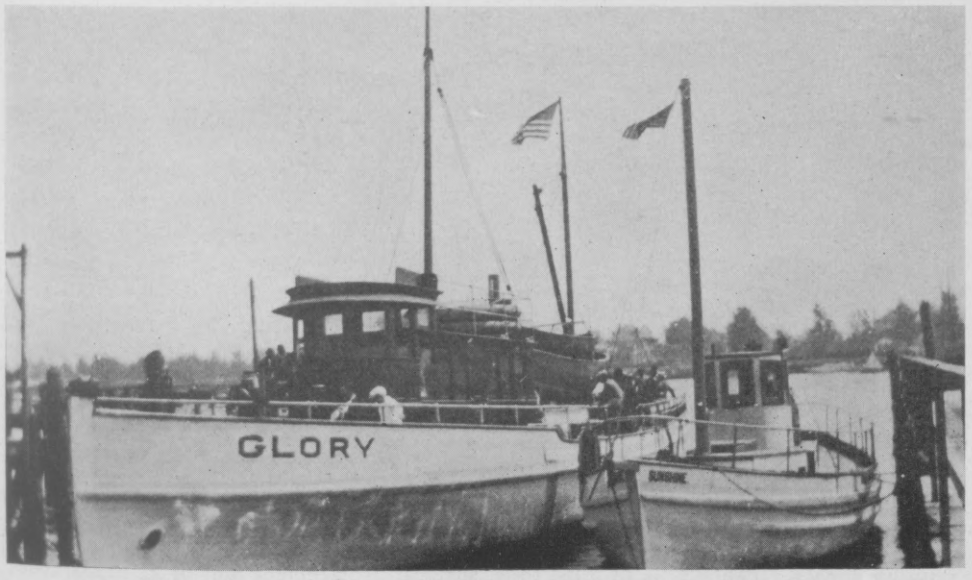
The lay of the land surrounding New York City is such that it affords little or no opportunity to the hundreds of thousands of amateur fishermen who make up a part of its population an adequate opportunity to indulge in their favorite sport. As a result, opportunities to do deep-sea fishing are greatly in demand and on summer weekdays and holidays the subways leading from the heart of the city to places like Sheepshead Bay contain large numbers of fishing enthusiasts picturesquely adorned with baskets, rods and tackle. What they want is an opportunity to get out to the deep-sea fishing grounds with the least possible delay in order that the greatest possible number of hours may be available for them to enjoy their favorite pastime. No rising hour is too early for them and many of the boats carrying fishing parties start out from the Sheepshead Bay docks as early as 6 A. M.

What they want above all things is a seaworthy craft that is capable of safely riding the big Atlantic swells and that is powerful and speedy enough not to waste precious time on the outward and return trips. Steam-boats have been used for this purpose in the past and the smaller ones have been propelled by gasoline engines. Even when steam vessels of 500 h.p. or less have been run non-condensing, they have been found notoriously uneconomical to run, not only because of the mounting costs of suitable grades of coal, but also because their fuel consumption has been greatly increased on account of standby firing while taking on passengers and while laying to at the fishing grounds. Neither have dirt, ashes, and cinders been found to act as attractions for patronage. To provide adequate power by means of gasoline power has not always been easy because of constructional limitations to which gasoline engines are subject.

Her oil-engine propelling machinery therefore makes the GLORY a strong drawing card for Captain Martin's fishing parties. She is direct reversible and is fitted with a sliding camshaft on which are mounted bevel-sided cams for ahead and astern running. The engine burns heavy fuel, obtainable at about one-third the price of gasoline, on the well-known airless-injection system. For producing a fuel-injection pressure of about 3,500 lbs. per sq. inch a triplex pump is provided, regulation of the amount supplied to each cylinder being accomplished by the fuel-cam mechanism. Starting and reversing are carried out by means of compressed air and the manoeuvering gear is such that the vessel has the same flexibility as she would have with a clutch-connected engine. Starting air is supplied either by means of a small compressor direct driven from the engine or by a Bessemer gasoline-driven unit. The latter is an integral unit with the power and compressing cylinder cast in block and is capable of furnishing air not only for starting, but also for operating the anchor-windlass and the whistle.

Very complete temperature control is provided for still further enhancing the economical operation of the main engine. Dial thermometers show the temperatures of the bearings and at each exhaust connection there is a similar instrument reading up to 750° F. These were furnished by the Tagliabue Co. and operate by means of mercury columns encased in steel tubes.

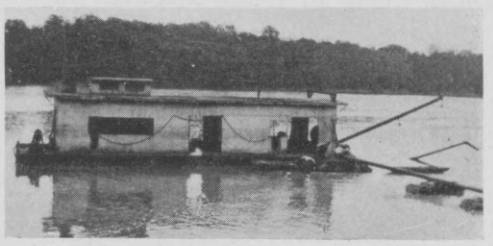
Electric light is provided by Standard Motor gasoline-driven generator of 2-kw. capacity direct-connected to a Garwood dynamo.



This oil-engine boat is proving popular at Sheepshead Bay

Shallow Draft Work Boats on Our Rivers

Stern-wheel tow-boats for use on our shallow rivers have until recently been propelled almost entirely by steam. Because of the peculiar nature of these installations, the steam plants used on them have been exceptionally wasteful, some of them consuming as much as eight lbs. of coal per horsepower-hour. As a reaction to this extreme condition, determined efforts are being made to remedy it and the contrast resulting from the replacement of steam stern-wheelers by oil engined craft is full of interest.



The W. T. Hardison Co. of Nashville, Tennessee, are operating a large boat of this kind on the Tennessee river. She is powered with a 110 s.h.p. Anderson oil engine of the surface-ignition type, and is doing the work on less than a tenth of the fuel that would be required for an equivalent steam-driven stern-wheeler.

EASTWOOD is another stern-wheel tow-boat used on the Missippi River by the East-

wood Sand and Gravel Works of Grayville, Ill. It has a 60 s.h.p. Anderson oil engine which drives the big paddle through the medium of a belted jackshaft and a sprocket chain. A Marion clutch built into the belt pulley on the jackshaft gives the Eastwood full maneuvering flexibility.

A type of shallow-draft service closely allied to stern-wheel work is the operation of so-called pump boats for sucking gravel out of the river-bed by means of centrifugal pumps. The Eastwood Company uses a 60 s.h.p. Anderson engine on a boat of this kind for running an 8-inch pump which lifts water and gravel 25 feet into the scows.

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Interesting Notes and News From Everywhere

World's Record of New Construction Ship's Performances and Other Matters of Note in the Motor Vessel and Oil Engine Industries

SINCE the first of the year over half a million tons of motorships have been ordered in Europe.

The Canadian Air Board's 40 foot aeroplane tender is to have a 90 b.h.p. Eastern Standard oil-engine.

It looks as if Lord Kylsant will soon be the great power in the British motorshipping industry that the late Lord Pirrie was.

AMAZON, one of the large passenger motor-liners building for the Royal Mail Line has had her name changed to ALCANTARA.

A nine-cylinder, two-cycle, double-acting Diesel engine of 15,000 s.h.p. has been ordered from the Augsburg works of the M.A.N.

The British motor-tanker INVERGARY recently arrived at Los Angeles harbor on her maiden voyage. She is operated by the Bank Line.

VOGTLAND, the Hamburg-America's latest motorship now about to run trials, has twin 2,000 s.h.p. Augsburg four-cycle Diesel engines.

In the Atlantic Refining Co.'s fleet of motor-tugs and motor tankers, Bates & Edmonds auxiliary oil-engined generating sets are being installed.

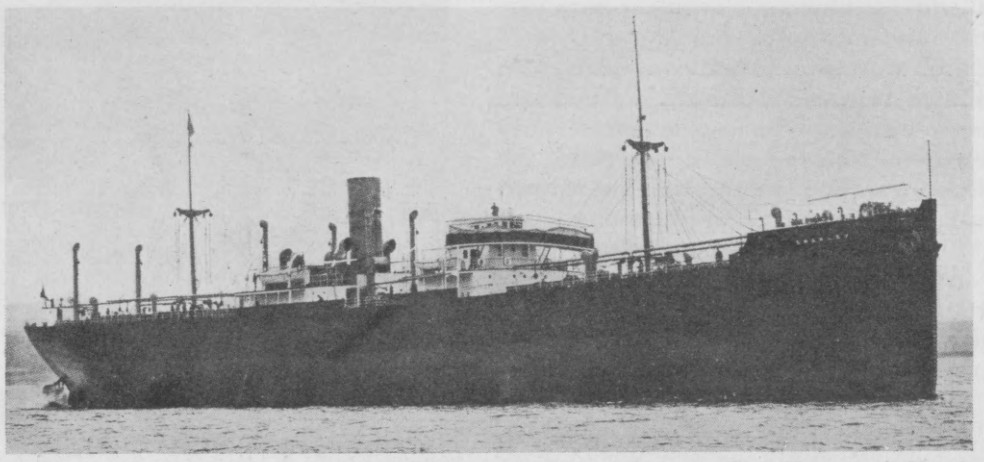
The North German Lloyd's 9,000 tons, 3,200 s.h.p. twin-screw Diesel-engined motorship KONIGSBERG was launched towards the end of June last.

Three single-screw 1,700 tons d.w. 800 s.h.p. motorships have been ordered by the Neptune Steamship Co. (Germany) from the Deutsche Werke, Kiel.

Chartered for log towing on the Fraser River is the newly-completed tug "C & S," which is powered with a 110 s.h.p. three-cylinder Union Diesel engine.

Albert L. Fairbanks has been appointed New York distributor for Kahlenberg engines, his office being at 222 East 42nd St., telephone Vanderbilt 8687.

For French coastal and river service, the 375 tons d.w. motor-tanker LUCIFER has been built at Caen and powered with twin 130 s.h.p. Kromhout oil engines.



First British-built motorship with double-acting Diesel engines—The "Swanley," North British equipped

Two 1,750 i.h.p. Deutsche Werke Diesel engines will be installed in a 11,000 tons d.w. cargo motorship ordered from the builders of the engines at Kiel.

R. D. Bean has been appointed chief engineer of the Brown Instrument Co., in charge of the manufacturing of their pyrometers, thermometers, tachometers, etc.

GLENBANK, one of the Bank Line's new 5,200 tons gross motorships was delivered by Harland & Wolff on June 27th. Twin Harland-B. & W. Diesels are installed.

CAMRAHN, the Chargeurs Reunis', 17,175 tons displacement 2,400 s.h.p. Sulzer engined motorship, has made a trip from Nantes to St. Nazaire, where trials will be run.

Alfred I. DuPont's new 132-ft. Diesel yacht is to be built by the Newport News Shipbuilding & Dry Dock Co. Twin 180 s.h.p. Nelseco Diesel engines will be installed.

A Diesel-electric pipe-line dredge of 2,100 b.h.p. is to be built for the Atlantic Gulf and Pacific Dredge Co., Galveston, Texas. It will have McIntosh & Seymour Diesels.

W. Schuchman & Co., Geestemunde, the German salvage concern, claim to own the largest motor salvage vessel. This is the SEEFOLKE, fitted with 3,500 i.h.p. Diesel engines.

A 300 b.h.p. oil-engined ferryboat is being built for J. P. & F. M. Comfort of New Orleans by the Canulette Shipping Co., Slidall, La., at a cost of approximately $65,000.

Harris & Dixon, London shipowners have ordered another 9,000 tons motorship with North British double-acting Diesel engines, which will be a sister to the M.S. SWANLEY.

The meat-carrying motorship referred to in June as being ordered from Swan, Hunter & Wigham Richardson from the Commonwealth & Dominion Line is of 11,000 d.w.

Launch of the U. S. submarine V.I on July 17 at the Portsmouth navy yard, the first of nine authorized in 1916. She is fitted with twin Busch Sulzer engines of 2,400 s.h.p. for direct drive at full power, and with two B. S. Diesels of 1,000 s.h.p. for electric drive at cruising speeds. The V.I is of 2,164 tons, surface displacement and of 21 knots speed. Length, 341 feet 6 inches; breadth, 27 feet 6⅝ inches

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Two 13,000 tons d.w. motor-tankers have been ordered from the Blythswood yard by Knut Knutsen, Haugesund, Norway. Kincaid-Harland-B. & W. Diesel engines will be installed.

LYCIA, a new 4,000 tons d.w. motorship for the Brocklebank Line, was recently launched at Dunlop Bremmer's yard. A 1,150 s.h.p. Kincaid B. & W. Diesel engine is being installed.

A Palmer-Fullagar Diesel engine will be fitted in a sister 10,000 tons tanker to the BRITISH AVIATOR lately ordered by the British Tanker Co., from Palmers Shipbuilding & Iron Co.

Diesel engines will shortly be purchased by the General Petroleum Co., Los Angeles, for their 10,000 tons tanker LIO, recently purchased by them from the Shipping Board for conversion purposes.

The fleet of motorships for the Bank Line are rapidly taking the water. CEDARBANK, the seventh vessel, was launched on July 7th. She is of 5,200 gross tons, and is propelled by Harland-B & W Diesel engines.

VOLRATH THAM, a 9,000 ton steam-driven ore-carrier built in England in 1909 for the Grangesberg-Oxelösund, is to be converted to single-screw Diesel power of 2,600 i.h.p. by the Götaverken or Göteborg.

Successful acceptance sea trials of the motorship SWANLEY, equipped with a North British double-acting Diesel engine, were recently run off the Clyde, and the vessel loaded and proceeded for Colombo on July 9th.

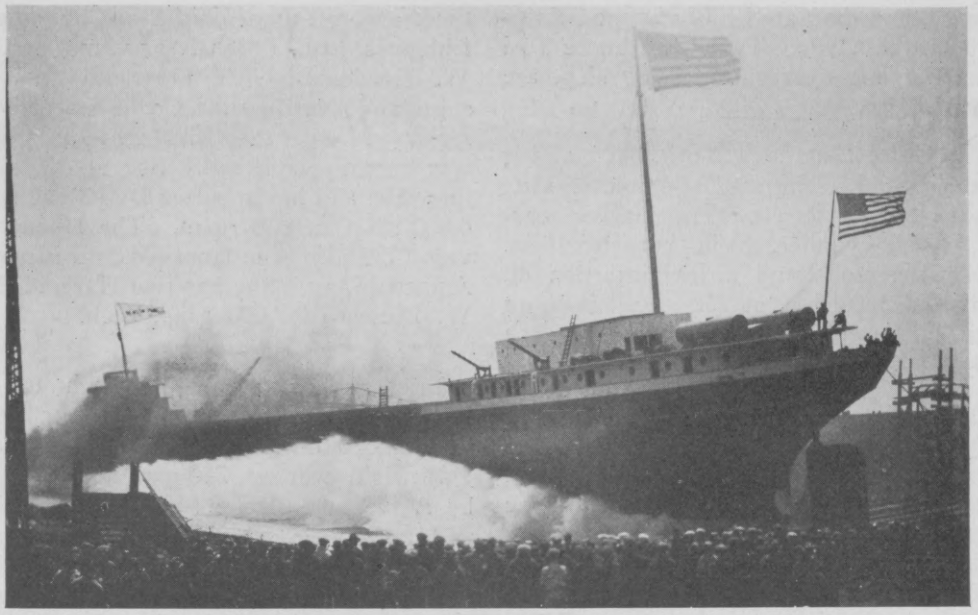
IOSSIFOGLU, the 8,250-ton d.w., 2,000 s.h.p. Neptune Diesel engine single screw motorship for the Ionian Marine & Land Investment Co. of London, ran trials on June 14. She is a sister vessel to the SILVERPINE.

Delivery has been made by Workman-Clark, Belfast, of the motorship MARUDU just completed for the Straits Settlements Steamship Co. A Burmeister & Wain Diesel engine built at Copenhagen is fitted.

SONNITEP is the name of the sister motor-tug to the HUSTLER, and was recently placed in the service of the Diamond P. Transportation Co., Philadelphia, Pa. Both boats are driven by 320 s.h.p. Ingersoll-Rand oil engines.

SLIEDRECHT is the name given to the 6,500 tons d.w. motor-tanker recently launched at the Rotterdam Draydock to the order of the De Maas Steamship Company. A 1,850 s.h.p. at 90 r.p.m. Harland, B. & W. Diesel engine is installed.

A Norwegian shipbuilder named Lindstal of Risor, 80 years of age, has just built and launched the 80 tons ocean research motorship ALBACORA to the order of the Portugese Government. A 60 b.h.p. Bolinder oil engine is installed.



Launch of the "Benson Ford" at the Great Lakes Shipbuilding Plant, River Rouge, Mich. She is one of the two Sun-Doxford Diesel-driven lake ore-carriers for the Ford Motor Co. She ran trials on July 28 which we attended

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J. H. Jones, Vice-President of Charles Cory & Son, sailed on SS. GEORGE WASHINGTON to attend the British Empire Exposition at Wembly. While abroad Mr. Cory will also investigate the marine and industrial conditions on the continent.

The Adelaide Steampship Co., Adelaide, have not, as reported elsewhere, ordered a 350 s.h.p. Kromhout oil engine for installation in a small motorship building at Geo. Brown's yard at Greenock on the Clyde. The vessel is for another concern.

As we close for press we have received a copy of the new Bethlehem Shipbuilding Corporation, Ltd., dealing with the Bethlehem-Trout two-cycle oil-engine, which is being built at their Elizabeth plant to supplement the large Bethlehem Diesel engine.

At a cost of 2,750,000 kroner, an 8,000 tons d.w. motorship has been ordered by the Orient Steamship Co., of Copenhagen, from the Nakskov Shipbuilding Co. At the current exchange rate of 16.10 cents to the kroner, this figures out at $55.34 per d.w. ton.

In Great Britain Diesel oil is now £5-2-6 per ton ($22 at current exchange rates), while boiler oil is £4-2-6 ($17.75) per ton. Many British motorships, however, are using boiler oil in conjunction with centrifugal purifiers in preference to the higher-priced Diesel oil.

J. Alden's new auxiliary motor-yacht SEADRIFT will shortly leave Livingstone & Cooper's yard Hessle, England, where she has just been built, for the United States. She is 81½ ft. long and is powered with a three-cylinder Mianus oil-engine. Trials were recently run.

The 9,500 tons displacement passenger-cargo motorship RIO PANUCO, of H. Schuldt's Ocean Line, was launched by Krupps on June 22nd. Twin 1,400 s.h.p. Diesels are installed, and will drive her at 13 knots. One hundred first-class passengers will be carried.

A North Eastern-Werkspoor double-acting Diesel engine of 4,000 s.h.p. at 95 r.p.m. is to form the propelling power of a Blue Funnel Line single-screw motorship to be built by the Caledon Shipbuilding & Engineering Co., Dundee, to the order of Alfred Holt & Co., England.

We had the pleasure of attending the builder's trials on July 28th at Detroit of the Ford Motor Company's new 612 ft. ore-carrying motorship BENSON FORD. A complete story together with illustrations will be published in our September issue. The launching is depicted above.

In our description of the motor yacht ARA, which appeared in the May issue of MOTORSHIP on page 339, we erroneously referred to the use of two brake horsepower Gardner oil engines for generating auxiliary power. These two engines actually are rated at 54 brake h.p. each.

Bates & Edmonds, of Lansing, Mich., have just shipped to Paris, France, a two-cylinder 12 b.h.p. Bulldog heavy-oil engine, which is to be fitted in a small boat in conjunction with a generator and motor. It will form the smallest Diesel-electric-drive installation in existence.

Owen, Watkins & Williams & Co.'s Golden Cross Line, of Cardiff, Wales, will shortly take delivery of their new 11,000 tons d.w. coal-carrying motorship SILURIAN

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recently launched at the Blythswood Shipyard on the Clyde. Twin Beardmore-Tosi Diesel engines aggregating 3,500 i.h.p. are installed.

The Grace Line, New York, has building at the Spedden shipyard, Baltimore, Md., a motor-tug for its New York harbor service. A six-cylinder, 13-in. bore by 19-in. stroke Ingersoll-Rand airless injection oil engine of 320 s.h.p. at 250 r.p.m. is being installed. Delivery will be made in the early Fall.

One of the greatest motorship enthusiasts on the Great Lakes, A. C. Jackson of Detroit, died on June 7th last. Although ill since 1919 and confined to bed during the last twenty months, he has constantly sent us communications intended to develop the oil-engine on inland waters, his work in this connection being tireless.

Lord Kylsant, at the annual meeting of Elder Dempster & Co., stated that the motor-passenger liners which they placed in service in the West African trade have become deservedly popular with passengers to and from the West African coast. He referred to the placing in service of these Diesel ships to be a progressive policy.

Blohm and Voss are replacing the steam machinery of the Hamburg-American Line's 400 ft. freighter ALTMARK with a three-cylinder, two-cycle, double-acting M.A.N. Diesel engine of 2,000 s.h.p. at 75 r.p.m. This step is significant because the vessel is comparatively new, having been built at Sunderland, England, in 1920.

The 220 s.h.p. gasolene engine has been removed from the Hawaiian tug MAKAALA and replaced by a 150 s.h.p. Fairbanks Morse oil engine. Young Bros., of Honolulu, who also own the 300 s.h.p. Fairbanks Morse oil-engined tug MIKIOI, and the twin 60 s.h.p. Fairbanks Morse engined motor sampan LELEIONA, may soon build two more tugs.

TUEGSHA is the name of the seventh motorship just launched at the Deutsche Werft, Hamburg, to the order of Wilhelm Wilhelmsen, Tonsberg. She is of 9,250 tons d.w. and of 4,000 i.h.p. on twin screws. Speed, 12 knots. Two B. & W.-A. E. G. four-cycle Diesels are installed. The eighth motorship at this yard for this Norwegian shipowning concern is under construction.

A Swedish Government loan of 1,060,000 Kr. has been asked by the Angfartygs Aktiebolag Ferm of Kristinehamn, representing half the cost of two motorships; one of 2,500 tons d.w., building at Kockum's Yard, Malmo, and one of 6,500 tons under construction at the Eriksberg Yard, Göteborg. The contract price of the latter is 1,562,500 Kr. or $64 per d.w. ton at current exchange rates.

As previously stated, two motorships for the Nippon Yusen Kaisha are building at Lithgows, Ltd., Port Glasgow, and at D. & W. Henderson Co.'s (Harland & Wolff subsidiary) yard on the Clyde, respectively. ATAGO MARU, the Lithgow-built vessel, was recently launched. She is of 10,000 tons d.w. and has a Sulzer Diesel engine of 4,000 s.h.p. at 100 r.p.m. The Henderson vessel has also been launched, and is named ASUKU MARU. She has two Harland-B. & W. Diesels of 2,000 s.h.p. each.

Trials were run on June 26th of the Royal Mail S. P. Meat Transports Ltd's. new 14,000 d.w. motorship LOCHMONAR. Twin eight-cylinder, 740 mm. bore (29.13") by 1, 150 mm. stroke (45.27") 3,200 i.h.p. at 115 r.p.m. Harland B. & W. Diesel engines are installed, as well as four 150 b.h.p. auxiliary Diesel engines and 100 k.w. generators. Accommodation for 12 passengers is provided. Length 485 ft. by 62 ft. by 39½ ft. She will trade between Great Britain and North America. All accommodation is electrically heated, and there are 16 electric winches on deck.

The June issue of "The Compass," a trade pamphlet devoted to lubrication, contains a large amount of material on marine Diesel engines and the special oils which have been developed for them. A chapter excellently illustrated with colored cross-sections and drawings fully explains the action and working of the centrifugal oil purifier; it is by far the clearest and most readily understood treatment of this subject which has come to our attention thus far. Copies of "The Compass" may be obtained without charge by applying to MOTORSHIP's Results Department.

Kr. 1,070,000 (Swedish) is the contract price of a 4,700 d.w. tons single-deck motorship building at the Vulcan yard, Hamburg, to the order of a Scandinavian shipowner. Twin 575 s.h.p. Vulcan M.A.N. Diesel engines are to be installed. All deck machinery will be electrically driven. This price at the current exchange rate of approximately 27 cents to the Kroner works out at $288,900 or $61.46 per ton. This is 40% less than the cost of building a new motorship in the United States, but higher than the cost of a steamer purchased from the Shipping Board and converted to Diesel power.

Our Readers' Opinions

(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed)

More on the Literary Style

To the Editor of MOTORSHIP:

I was very much surprised to read the comments of our good friend, Professor Gross, University of California, in last month's issue of MOTORSHIP. I have been one of the readers of your publication for several years and have always commented on the practical method of presenting the articles in your paper both in a technical and interesting way.

Though I hold a college degree, and am in full sympathy with all students that are able to obtain a college education, I believe a publication such as the MOTORSHIP, that is able to present the motorship and Diesel engine in a concise way is doing much to further the cause of the Diesel future.

H. E. PICKERING.

Port Superintendent,
Swayne & Hoyt, Inc.,
San Pedro, Calif.

Of the Same Opinion

To the Editor of MOTORSHIP:

Just a word regarding your most valuable periodical does not seem amiss at this time. In the April issue I saw where a certain college professor took exceptions to your methods of presentation of facts, etc. Allow me to inform you that is just where you win. If we had more people who would present their subjects in a straightforward manner, I think we could all possibly understand the meaning they wish to convey, in a more satisfactory manner.

I have found that the parlor linguist (although perfectly proper on some occasions) does not cut much ice in matters pertaining to the mechanical engineering profession.

I am heartily in accord with the parties who present themselves in a straightforward manner (straight from the shoulder; so as to speak) and have found that in twelve years practice, frankness is the keynote to success. I have also noted that those whom I apparently hurt the worse by my methods have become my best supporters as time wore on. A recourse of our national history will show any one in doubt, that our most successful men have been examples of frankness to the 'nth degree. The way and manner in which the question of ship conversion is being treated seems to me unwarranted, also the fact of so much tonnage going to European yards seems not in keeping with true American ideals. We all know that the shops and yards of this country are not behind schedules at the present, I still hold an interest in all maritime matters, and fully realize that the days of cheaper power are upon us, and in the heavy-oil motor lies the most logical solution.

Trusting that you will not relax in your endeavors to keep the OIL FIRES BURNING, and that in the near future the solution of wholesale conversion may be accomplished.

Wishing you all success in your enterprise,

E. S. Bursley.

Dexter, Maine.

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Powerful Diesel Dredge Ordered

Orders have been placed by the Atlantic Gulf and Pacific Company for a 24-inch hydraulic pipe-line dredge. The hull will be built by the Newport News Shipbuilding & Dry Dock Company, whereas power for running the dredge pump and for driving two Westinghouse generators will be furnished by McIntosh & Seymour Diesel engines. Since the dredge is not self-propelled, all the power is utilized for dredging and auxiliary purposes.

General dimensions of the hull are 162 x 38 x 24 feet. One large Diesel of 1,150 b.h.p. will drive the main centrifugal pump through the medium of a step-up Fawcus herringbone-gear transmission. The two remaining Diesels for driving the two generators will be of 500 b.h.p. each.

Motorship "Pinthis" Ready

C. D. Mallory's motor tanker PINTHIS was due to be finished at Newport News on July 1st. Pacific-Werkspoor Diesels are installed.

Diesel Passenger Boat "Harbour Princess"

A passenger vessel for the Harbour Navigation Co. of Vancouver, British Columbia was launched from the ways of the Vancouver Shipyard, Ltd., the latter part of July, and named HARBOR PRINCESS. This boat is the first Diesel-engined passenger boat to be built at Vancouver, though there have been a number of tugs, small freighters and some yachts and auxiliary merchant schooners built and equipped with Diesel and other types of oil engines. The Harbour Navigation Co. operates a fleet of passenger vessels to Port Moody and up the North Arm of Burrard Inlet from Vancouver; making calls at mills, oil refineries and other industrial landings, and during the summer at the many summer colonies and resorts up the North Arm which runs back into the mountain ranges, a distance of twenty-one miles from the harbour entrance.

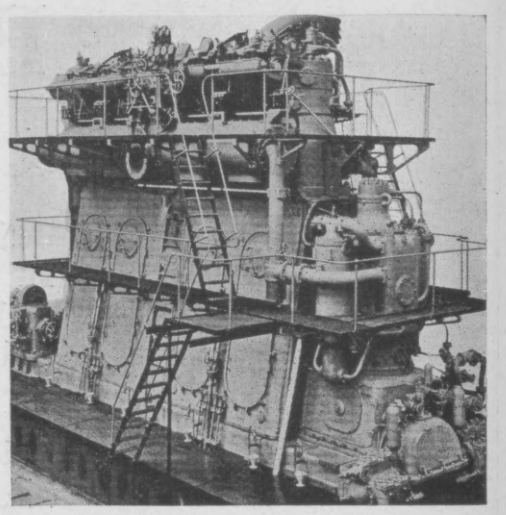
Previous to this year this company operated steam and gasoline-engined craft on this run; but early in the season installed a 60 h.p. Mianus oil-engine in place of a gas-engine in their passenger boat Lo-Olbee; and about the same time placed the order with the Vancouver Shipyard, Ltd., to build the 110 foot HARBOR PRINCESS from designs by T. Halliday, while her four-cylinder two-cycle 220 h.p. Polar Diesel engine was ordered from the Atlas Diesel Co. of Stockholm through the B.C. Equipment of Vancouver. The principal dimensions of HARBOR PRINCESS are: 110 feet o.a. 18 feet beam, and 9 feet moulded depth, with a draft of 7 feet 6 inches.

Passenger accommodation consists of a large cabin forward and another aft below the main deck.

Her engine is of the direct-reversing air-injection type with a cylinder bore of 290 mm. and stroke of 430 mm. It develops 220 b.h.p. at 230 r.p.m. and turns a 67" by 74" three-blade propeller. Two additional cylinders at the forward end of the main crank shaft, having cranks set at 90 degrees work as a double-acting air engine for starting and manoeuvring till the working cylinders mence firing.

The HARBOR PRINCESS was taken out on a trial trip on July 11th, with a party on board, making a favorable impression on account of her easy manoeuvring qualities and good turn of speed, though no record of her exact speed was obtained.

Vancouver Passenger Boat "Harbour Princess"



An 1,800 s.h.p. four-cylinder two-cycle Wallsend-Sulzer Diesel engine for a single-screw motorship building at the Furness Shipyard, Haverton, England. It turns at 90 r.p.m. and has just run shop tests

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